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STUDIES

OF

NATURE.

BY

JAS.-HENRY-BERNARDIN DE SAINT-PIERRE.

..... MISERIS SUCCURRERE DISCO.

MATHEMATICAL SOCIETY. SPITAL FIELDS.

TRANSLATED BY

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FIFTH EDITION.

IN FOUR VOLUMES.

VOL. II.

Royal Astronomical Society.

LONDON:

PRINTED FOR J. MAWMAN; J. WALKER; LONGMAN, HURST, REES, AND ORME; VERNOR, HOOD, AND SHARPE; C. LAW; LACKINGTON, ALLEN, AND CO.; B. CROSBY AND CO.; J. RICHARDSON; AND J. M. RICHARDSON.

1809.

8087

H. Bryer, Printer, Bridge-street,
Blackfriars, London.

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EXPLA-

REVERBERATING FLOWERS.

5. In horizontal Plans.
6. Or Parabolic.
4. Elliptic.
3. Spheric.
2. Conic.
1. Perpendicular.

1. Ear of Corn.

2. Convolvulus of the Day.

3. The Simple Rose.

4. The Tulip.

5. The Daisy.

6. The Nun of Peru.

7. Ear of Rice.

8. Convolvulus of the Night.

9. Pea Blossom.

10. The Imperial.

11. The Blue Bottle.

11. In unequal Plans.
10. In the Ellipse inverted.
9. In the Sphere folded inwards.
8. In a cone closed.
7. Divergent.

PARASOL FLOWERS.

EXPLANATION OF THE PLATES.

FLOWERS. PLATE III.

Volume II. Page 307.

AS the explanation of this Plate is inserted in the text, all I shall say of it here is this, that the forms of flowers which have a direct relation to the Sun, may all be reduced to those five primary patterns of flowers, to reverberated, perpendicular, conic, spheric, elliptic, and plane or parabolic; and flowers which have negative relations to the Sun, to the five other patterns of flowers in parasol, which are here represented in contrast with the first. At the same time, though these last be of forms much more diversified than reverberated flowers, all their negative species may be referred to those five positive forms.

I am of opinion, that if there were added to those five positive, or primordial forms, a certain number of accents, to express the modifications of them, we should have the true characters of the florification, and an alphabet of that agreeable part of vegetation. I likewise presume that by means of this alphabet, it might be possible to characterize, on geographical Charts, the different sites of the vegetable kingdom. It would be sufficient to apply the signs of them to the forests which are there represented; for on seeing in the Chart, for the sake of supposition, that of the reverberated perpendicular, expressed by an ear of corn, or a prominent cone, we should instantly

distinguish in it the forests of the North, or those of cold and lofty mountains. Particular accents, superadded to this character of prominent cone, would distinguish from each other the pine, the epicea, the laryx, and the cedar; and rays issuing from these modified characters, would indicate the extent of the kingdoms of those different species of trees. The thing is not so difficult as may be imagined. Geography easily represents forests upon maps; all that would be farther requisite, therefore, is to affix to them certain signs, in order to ascertain their species, and those signs might likewise characterize, as we have seen, the latitude, or the elevation of the soil. Besides, we should leave out of such botanical Charts a multitude of political divisions, the names of which, in large characters, uselessly fill up a great deal of room. We should represent them in the domains of Nature only, and not those of men. Thus by means of these botanical signs, we might distinguish, at a single glance, on a map, the productions natural to each soil, the forests with their different species of trees, nay, the meadows too with the varieties of their herbage. There might be farther conveyed the humidity or the dryness of the territory, by adding to the signs of the flowers, the characters of the leaves and seeds of vegetables. To these might afterwards be affixed, on the cities and villages represented, ciphers expressing the number of families which inhabit them, as I have seen in Turkish maps: thus we should have Charts really geographic, presenting at the first glance, an image of the richness and of the temperature of the territory, and of the number of it's inhabitants. After all, this is not a plan which I presume to prescribe, but ideas which I have ventured to suggest, to be pursued, improved, and brought to perfection.

VOLATILE

LEAVES WITH AN AQUEDUCT, AND, VOLATILE FRUITS OF MOUNTAIN VEGETABLES.

Leaves & Seeds of the Mountain Maple.
Spartha, or, rush of the Spanish Mountains.
Rush of the Marshes.
Leaf, & Cone, of the Cedar of Lebanon.
Stump of the Spartha with its Gutter.
Leaf, & Seeds, of the Dandelion.
Full Stump, of the Rush of the Marshes.
Kernel of the Cedar attached to its Wing.

VOLATILE GRAINS. PLATE IV.

Volume II. Page 336.

HERE is presented, on the one hand, the spartha, or rush of the Spanish mountains, hollowed in a gutter, for the purpose of receiving the rain water; and, on the other, the cylindric or full rush of the marshes. The grain of this last resembles in it's state of expansion the eggs of a lobster. I have not been able to procure any of the grains of the spartha; but I have no doubt that, in opposition to those of the rush of the marshes, it must have a volatile character. I do not so much as know whether the spartha fructifies in our climate. Messrs. *Thouin*, the principal gardeners of the Royal Garden at Paris, could easily have gratified my curiosity in this respect. To these gentlemen I stand indebted for furnishing me with the most of the grains and leaves which I have got engraved for this Work, among others the cone of the cedar of Lebanon; but accustomed in my solitary studies to investigate in Nature alone the solution of the difficulties which she throws in my way, I did not make application to them, though their hearts are replete with liberality and complaisance toward the ignorant as well as the learned.

Whatever the case may be as to this, it is to the fruit that Nature attaches the character of volatility; and it is by the leaf that she indicates the nature of the site in which the vegetable is destined to grow. Accordingly we perceive in this plate the cone of the cedar to be composed of thin flakes, like the artichoke. Every flake carries it's kernel; such is the one here represented detached from the cone; and each of them, as the fruit comes to maturity,

maturity, flies off, by the help of the winds toward the summit of the lofty mountains to which it is destined. Remark likewise that the leaves of the cedar are filiform ; in order to resist the winds, which are violent on lofty mountains, and they are aggregated into clusters resembling pencils, for the purpose of collecting in the air the vapours which float about in it. Each leaf of this tree has more than one aqueduct traced in it lengthwise ; but being extremely minute, it was impossible to express it in the engraving. Farther, that filiform and capillaceous shape, so well adapted to resisting the winds, as well as that which is of the sword-blade form, is common to vegetables of the mountains, such as pines, larches, cedars, palm-trees ; it is likewise frequently found on the edge of waters equally exposed to violent winds, as in rushes, reeds, the leaves of the willow ; but the foliage of these last differs essentially from that of the first, in that there is no aqueduct in it, whereas the leaves of mountain vegetables have one : neither is their aggregation similar.

The dandelion grows like the cedar, in dry and elevated situations. It's grains are suspended to a complete sphere of shuttle-cocks, which forms outwardly a very regular polyedron, having a multitude of hexagonal or pentagonal faces. These faces are not expressed in the print, because it has been copied after that of a highly valued botanical Work, but which, like books in every department of literature, collects only the characters which make for a favourite system. The leaf of the dandelion particularly determines it's natural site ; it is broad and fleshy, because expanding itself close to the ground, on which it forms stars of verdure, it has nothing to fear from the winds : it is deeply indented, like the teeth of a saw, for the purpose of opening a passage to the grasses ; and it's indentings are bent inward to catch the rain-water, and convey it to the roots. Thus Nature adapts the means to each subject, and redoubles her attention in proportion

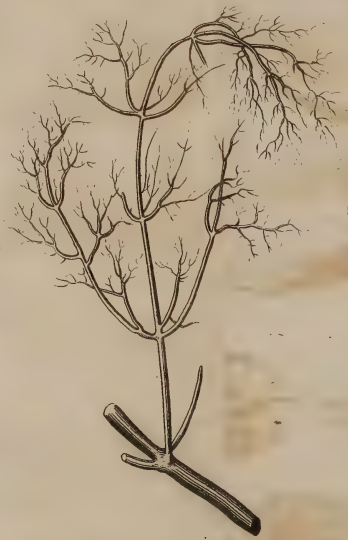
proportion to it's weakness. The sphere of the dandelion is more artfully formed than the cone of the cedar, and beyond all contradiction much more volatile. It requires a tempest to carry the seeds of the cedar to any considerable distance; but the breath of the zephyr is sufficient to resow those of the dandelion. A Lebanon is likewise necessary for planting the first; but the second needs only a mole-hill. This small vegetable is likewise more useful in the World than the cedar: it serves for food to a great many quadrupeds, and to a variety of small birds, which fatten on it's grains. It is very salutary to the human species, especially in the Spring season. We accordingly find great numbers of poor people at that time picking up it's young shoots in the fields. It is moreover the only plant which Nature presents gratuitously to Man in our Climates. It universally thrives in dry places, and even in the seams of the pavement. It frequently carpets the court-yards of Hotels, the masters of which are not over-burthened with vassals, and seems to invite the miserable to walk in. It's gold coloured flowers very agreeably enamel the foot of the walls, and it's feathered sphere, raised upon a long shaft, in the bosom of a star of verdure, is by no means destitute of beauty.

It is the leaf then which particularly determines the natural site of a vegetable; for as we have seen there are aquatic plants which have their grains volatile, because they grow on the brink of lakes or marshes which have no currents, such as the willow and the reed; but their leaves in that case have no aqueduct. Nay, there are some which have a pendent direction, and which from that attitude refuse to admit the water from Heaven. The maple of Virginia, which delights in the brinks of lakes, marshes, and creeks, has grains attached to membraneous wings, resembling those of a fly, as the seeds of the mountain maple represented in the plate. But there is this remarkable

able difference between them, that the broad leaf of the first is pendent, and attached to a long tail; that this tail, so far from being furnished with an aqueduct has a ridge; and that the leaf of the mountain maple, which is of a moderate size, angular and barky, for resisting the winds, rises almost vertically, and bears an aqueduct on it's tail, to receive the waters of Heaven.

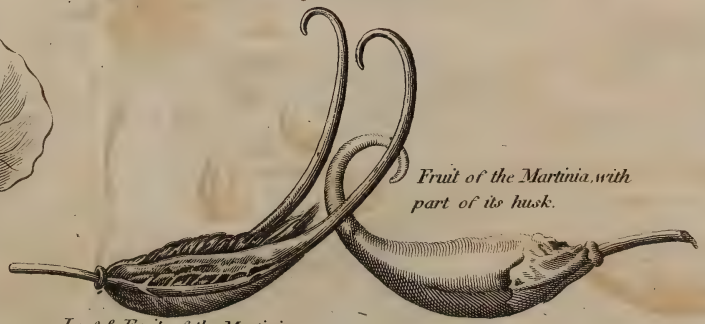
AQUATIC

LEAVES, WITHOUT AN AQUEDUCT; & NAUTICAL FRUITS, OF VEGETABLES OF THE SHORE.



Leaf, & Seeds of Fennel.

Leaf, & Fruit of the Walnuttree.



Fruit of the Martinia, with part of its husk.

Leaf, & Fruit, of the Martinia, of the shore of la Vera Cruz.

Leaf, & Seeds, of the Nasturtium.

J. Scott Sculp.

AQUATIC GRAINS. PLATE V.

Volume II. Page 353.

AQUATIC grains have characters entirely opposite to those which are produced on the mountains; if we except, as has been said, those which thrive on the brink of stagnant waters; but even these possess at once volatile and nautical characters, for they are amphibious. They swim along the surface of the water, and they fly through the air; such is that of the willow and several others. It is the leaf which determines the site, as we have observed, for aquatic plants never have any aqueduct on their leaves. Nay, most of them repel the water. The leaves of the nymphæa and of the reed are never wet. It is likewise so with those of the nasturtium, which are never humid, however copiously the rain may fall, though that plant is excessively fond of the water; for the culture of it consumes an incredible quantity. I am persuaded that if a morass were sown with plants of this sort, it would be speedily dried up. The leaf of the martinia of Vera Cruz, which is here represented among aquatic plants, is, on the contrary, always humid. It has even in it's first expansion a fluting on it's tail. From this double mountain character I am disposed to suspect that the martinia naturally grows on the parched and sandy shores of the Sea; for Nature, in the view of varying her harmonies, extends very dry places along the brink of the waters, just as she deposits sheets of water and morasses in the bosom of mountains. But from the form of the pod of the martinia, which resembles a hook for fishing gilt-heads, I believe it to be destined to grow in situations exposed to inundations of the Sea, as is in fact the case with the territory of Vera Cruz, from whence this

this species originally is. I presume therefore that when the shores of Vera Cruz are overflowed by high tides, you must see fishes caught by this plant, for the stem of it's pod is not easily broken off: it's two crotchets are pointed like fishing-hooks, are elastic, and hard as horn. Besides when it is soaked in water, it's furrows, shaded with black, shine as if they were filled with globules of quick-silver. Now the lustre of this light is a farther bait to attract the fishes. I present these merely as conjectures; but I found them on a principle which is indubitably certain, namely, That Nature has made nothing in vain.

STUDIES OF NATURE.

STUDY EIGHTH.

Replies to the Objections against a divine Providence, and the Hopes of a Life to come, founded on the incomprehensible Nature of GOD, and on the miseries of a present State.

"WHAT avails it me," some one will say, "that my tyrants are punished, if I am "still to be the victim of tyranny? Is it possible "that such compensations should be the work of "GOD? Great Philosophers, who have devoted their "whole life to the study of Nature, have refused to "acknowledge it's Author. Who hath seen GOD at "any time? What is it that constitutes GOD? But "taking it for granted that an intelligent Being di-"rects the affairs of this Universe, Man assuredly is "abandoned to himself: no hand has traced his ca-"reer: as far as he is concerned, there are, ap-"parently, two Deities; the one inviting him to "unbounded enjoyment, and the other dooming "him to endless privation; one God of Nature, and "another God of Religion. Man is left totally un-"certain whether of the two he is bound to please;

" and whatever be the choice which he is determin-
" ed to make, how can he tell whether he is render-
" ing himself an object of love or hatred?

"His virtue itself fills him with doubts and scruples;
" it renders him miserable both inwardly and out-
" wardly; it reduces him to a state of perpetual war-
" fare with himself, and with the world, to the in-
" terests of which he is obliged to make a sacrifice of
" himself. If he is chaste, the world calls him impo-
" tent; if he is religious, he is accounted silly; if he
" discovers benignity of disposition to those around
" him, it is because he wants courage; if he devotes
" himself for the good of his country, he is a fanatic;
" if he is simple, he is duped; if he is modest, he is
" supplanted; he is every where derided, betrayed,
" despised, now by the philosopher, and now by the
" devotee. On what foundation can he build the hope
" of a recompence for so many struggles and morti-
" fications? On a life to come? What assurance has
" he of it's existence? Where is the traveller that
" ever returned from thence?

" What is the soul of man? Where was it a
" a hundred years ago? Where will it be a century
" hence? It expands with the senses and expires
" when they expire. What becomes of it in sleep,
" in a lethargy? It is the illusion of pride to ima-
" gine that it is immortal: Nature universally points
" to death, in his monuments, in his appetites, in
" his loves, in his friendships: Man is universally re-
" duced to the necessity of drawing a veil over his
" idea. In order to live less miserable, he ought to
" *divert* himself, that is, as the word literally imports,

" he

" he ought to *turn aside* from that dismal perspective " of woes which Nature is presenting to him on " every side. To what hopeless labours has she not " subjected his miserable life? The beasts of the " field are a thousand times happier; clothed, lodg- " ed, fed by the hand of Nature, they give them- " selves up without solicitude to the indulgence of " their passions, and finish their career without any " presentiment of death, and without any fear of an " hereafter.

" If there be a GOD who presides over the destiny " of all, he must be inimical to the felicity of the hu- " man Race. What is it to me that the Earth is " clothed with vegetables, if I have not the shade of " a single tree at my disposal? Of what importance " are to me the laws of harmony and of love, which " govern Nature, if I behold around me only ob- " jects faithless and deceiving; or if my fortune, " my condition, my religion, impose celibacy upon " me? The general felicity diffused over the Earth, " serves only as a bitter aggravation of my particu- " lar wretchedness. What interest is it possible for " me to take in the wisdom of an arrangement which " renovates all things, if, as a consequence of that " very arrangement, I feel myself sinking, and ready " to be lost for ever? One single wretch might ar- " raign Providence, and say with *Job* the Arabian:* " *Wherefore is light given to him that is in misery, and* " *life unto the bitter in soul?* Alas! The appearances " of happiness have been disclosed to the view of

* Job, chap. iii. verse 20.

"Man, only to overwhelm him with despair of ever "attaining it. If a GOD, intelligent and beneficent "governs Nature, diabolical spirits direct and con- "found at least the affairs of the children of men."

I shall first reply to the principal authorities on which some of these objections are supported. They are extracted, in part, from a celebrated Poet, and a learned Philosopher, namely, *Lucretius* and *Pliny*.

Lucretius has clothed the philosophy of *Empedocles* and *Epicurus* in very beautiful verses. His imagery is enchanting; but that Philosophy of atoms, which adhere to each other by chance, is so completely absurd, that wherever it appears, the beauty of the poetry is impaired. For the truth of this, I confidently refer to the judgement of his partisans themselves. It speaks neither to the heart nor to the understanding. It offends equally in its principles, and in the consequences deduced from them. To what, we may ask him, do those primary atoms, out of which you construct the elements of Nature, owe their existence? Who communicated to them the first movement? How is it possible they should have given to the aggregation of a great number of bodies, a spirit of life, a sensibility, and a will, which they themselves possessed not?

If you believe, with *Leibnitz*, that those *monads*, or unities, have, in truth, perceptions peculiar to themselves, you give up the laws of chance, and are reduced to the necessity of allowing to the elements of nature, the intelligence which you refuse to it's AUTHOR. *Descartes* has, in truth, subjected those impalpable

palpable principles, and, if I may be allowed the expression, that metaphysical dust to the laws of an ingenious Geometry; and after him, the herd of Philosophers, seduced by the facility of erecting all sorts of systems with the same materials, have applied to them by turns, the laws of attraction, of fermentation, of crystallization; in a word, all the operations of Chemistry, and all the subtilties of dialects: but all with equal success, that is with none whatever. We shall demonstrate, in the article which follows this, when we come to speak of the weakness of Human Reason, that the method adopted in our Schools, of rising up to first causes, is the perpetual source of the errors of our Philosophy, in physics as well as in morals. Fundamental truths resemble the stars, and our reason is like the graphometer. If this instrument, constructed for the purpose of observing the heavenly bodies, has been deranged however slightly; if from the point of departure, we commit a mistake of the minutest angle imaginable, the error, at the extremity of the visual rays, becomes absolutely incommensurable.

There is something still more strange in the method which Lucretius has thought proper to pursue; namely, that in a Work, the professed object of which is to materialize the Deity, he sets out with deifying matter. In this he has himself given way to an universal principle, which we shall endeavour to unfold, when we come to adduce the proofs of the Divinity from feeling: it is this, that we find it impossible powerfully to interest mankind, whatever be the object, without presenting to the Mind some of the attributes of Deity. Before he attempts, therefore, to

dazzle the understanding, as a Philosopher, he begins with setting the heart on fire, as a Poet. Here is a part of his exordium.

.....Hominum divûmque voluptas,
Alma *Venus*, cœli subter labentia signa
Qua mare navigerum, quæ terras frugiferentes
Concelebras, per te quoniam genus omne animantûm
Concipitur, visitque exortum lumina solis,
Te dea, te fugiunt venti, te nubila cœli,
Adventuque tuo, tibi suaves dædala tellus
Submittit flores, tibi rident æquora ponti,
Placatumque nitet diffuso lumine cœlum.
. . . . . .
Quæ quoniam rerum naturam sola gubernas,
Nec, sine te, quidquam dias in luminis oras
Exoritur, neque sit lætum, neque amabile quidquam,
Te sociam studeo scribendis versibus esse,
Quos ego de rerum naturâ pangere conor.
. . . . . .
Quo magis æternum, da dictis, diva, leporem.
Effice ut interea fera munera militiai
Per maria, ac terras omnes sopita quiescant;
Nam tu sola potes tranquillâ pace juvare
Mortales, quoniam belli fera munera Mavors.
Armipotens regit, in gremium qui sæpe tuum se
Rejicit, æterno devictus vulnere amoris.
. . . . . .
Hunc, tu diva, tuo recubantem corpore sancto
Circumfusa super, suaves ex ore loquelas
Funde, petens placidam Romanis, inclyta pacem:
Nam neque nos agere, hoc patriai tempore iniquo,
Possumus æquo animo.

De Rerum Naturâ, lib. 1.

I shall endeavour, as well as I can, to give a plain prose translation of those beautiful verses.

"——De-

"——— Delight of men and gods, gracious *Ve-*
" *nus!* who presidest over the sail-bearing Ocean, and
" the fertile Earth, while the hosts of Heaven glide
" majestically silent around; since by thy prolific
" virtue, the whole animal creation teems with life,
" and turns the opening eye ball to the light of the
" Sun; at thy approach, O Goddess, the winds are
" hushed, the vapours that obscure the face of the
" sky disperse, the variegated ground spreads a car-
" pet of enamelled flowers underneath thy feet; the
" waters of the deep smile with joy, and the placid
" sky is overspread with a milder light.....Seeing
" then, that thou reignest sole Empress of Nature;
" since without thee no living creature rises into
" day, or possesses the capacity of receiving or com-
" municating delight, how gladly would I assume
" thee as my associate in the arduous undertaking
" on which I now enter—an enquiry into the na-
" ture of things—Give, then, O Goddess, somewhat
" of thy unfading grace to my strains. And grant
" meanwhile that the din of battle may cease over
" every land, over every sea: for with thee it rests
" to reduce the troubled world to peace; since
" Mars, all-powerful in arms, directs the thunder of
" war; who frequently retires well-pleased from the
" ensanguined plain, to solace himself in the soft
" dalliance of thy uncloying love.—In those fond
" moments, when affection can deny nothing, in-
" treat him to have compassion on his own Rome
" and thine, and bestow on it lasting tranquillity;
" for how can the voice of the philosophic Muse

"be heard amidst the confused noise of civil dis-
"cord?"*

Lucretius is, in truth, constrained to admit, in the sequel of his Poem, that this goddess, so wonderfully beneficent, is directly chargeable with the ruin of

* Mr. *Creech* and Mr. *Dryden* have both translated this passage of *Lucretius*. It would have saved me a little labour, had I dared to transcribe from either of their poetical versions. But, every thing considered, I have ventured rather to hazard one of my own. If it shall be deemed deficient in poetical merit, two qualities, at least, it possesses: it conveys enough of the sense of the Original, to answer the purpose of its being quoted in this Work, and it cannot possibly give offence to any modest ear.

VENUS, all hail! of Gods and men the pride;
Mov'd by whose power the heavenly bodies glide
In mystic round; thine is the teeming Earth;
To thee the swelling Ocean owes its birth:
Source of all life! thou breath'st the living soul,
And kindlest joy "from Indus to the Pole."
At thy approach the noisy tempests cease,
The air grows pure, and all the World is peace;
For thee the SPRING her flow'ry mantle waves,
For thee AUTUMNUS piles his golden sheaves:
The placid Deep reflects a clearer ray,
And Sol emits through Heaven a brighter day.
. . . . . .
Since, Goddess, thus all own thy sovereign power;
Since, without thee, none sees the natal hour;
Without thee, nought of fair, of sweet, is seen,
Delight of Nature! Universal Queen!
Visit thy bard with some celestial dream,
Be thou my Muse, for Nature is my theme.
. . . . . .
Around my lays the winning graces shed,
So shall immortal honours crown my head.

Meanwhile

health, of fortune, of parts, and, sooner or later, with the loss of reputation: that from the very lap of the pleasures which she bestows, there issues a something which embitters enjoyment, which torments a man, and renders him miserable. The unfortunate Bard himself fell a victim to this, for he died in the very prime of life, either from excessive indulgence, according to some, or poisoned, according to others, by an amorous potion administered by the hand of a woman.

In the passage above quoted, he ascribes to *Venus* the creation of the world; he addresses prayers to her; he bestows on her person the epithet of sacred; he invests her with a character of goodness, of justice, of intelligence, and of power, which belongs to GOD only; in a word, the attributes are so exactly the same, that, suppressing only the word *Venus*, in the invocation of his Poem, you may apply it almost entirely to the Divine Wisdom. There are even points of resemblance, so striking, to the representation given of it in the Book of Ecclesiasticus, that I cannot refrain from exhibiting the counterpart, that the Reader may have it in his power to make the comparison.

Ecclesiastes,

Meanwhile, command a troubled world to rest,
Bid the fierce soldier calm his angry breast.
Let Sea and Land thy genial influence feel;
Let placid Nations at thine altar kneel.
Besmear'd with blood, and sick of war's alarms:
Soothe back fierce MARS to thy all-conq'ring arms:
Tell him how Rome now bleeds at every vein;
Let thy sweet voice restore the gentle reign
Of golden SATURN. Bid the trumpet cease,
Let all in ROME, and all the WORLD be peace.——H. H.

Ecclesiastes, chap. xxiv.

Vulgate Latin Version.	*Common English Version.*
3, 4, 5, Ego ex ore Altissimi prodivi, primogenita ante omnem creaturam; ego feci in cœlis ut oriritur lumen indeficiens, & sicut nebula texi omnem terram. Ego in altissimis habitavi, & thronus meus in columna nubis.	3. I came out of the mouth of the Most High, and covered the earth as a cloud. 4. I dwelt in high places, and my throne is as a cloudy pillar. 5. I alone compassed the circuit of Heaven; and walked in the bottom of the Deep.
6, 7, 8, 9. Gyrúm cœli circuivi sola, & profundum abyssi penetravi; in fluctibus ambulavi, et in omna terra steti & in omni populo; & in omni populo primatum habui. Et omnium excellentium & humilium corda virtute calcavi, & in his omnibus requiem quæsivi, et in hæreditate domini morabor.	6. In the waves of the sea, and in all the earth, and in every people and nation, I got a possession. 7. With all these I sought rest: and in whose inheritance shall I abide?
— — — — — — — — — — — —	
13. Quasi cedrus exaltata sum in Libano, & quasi cypressus in Monte Sion.	13. I was exalted like a cedar in Libanus, and as a cypress-tree upon the mountains of Hermon.
14. Quasi palma exaltata sum in Cades, & quasi plantatio rosæ in Jericho. Quasi oliva speciosa in campis, et quasi platanus exaltata sum juxta aquam in plateis.	14. I was exalted like a palm-tree in Engaddi, and as a rose-plant in Jericho, as a fair olive-tree in a pleasant field, and grew up as a plane-tree by the water.
— — — — — — — — — —	
16. Ego quasi terebinthus extendi ramos meos, & rami mei honoris & gratiæ.	16. As the turpentine tree, I stretched out my branches, and my branches are the branches of honour and grace.
17. Ego quasi vitis fructificavi suavitatem odoris, & flores mei fructus honoris & honestatis.	17. As the vine brought I forth pleasant savour, and my flowers are the fruit of honour and riches.

18. Ego

18. Ego mater pulchræ dilectionis, et timoris, & agnitionis, & sanctæ spei. In me gratia omnis viæ et veritatis, in me omnis spes vitæ et virtutis.

19. Transite ad me, omnes qui concupiscitis me, & generationibus meis implemini.

20. Spiritus enim meus super mel dulce, et hæreditas mea super mel & favum.

18. I am the mother of fair love, and fear, and knowledge, and holy hope: I therefore being eternal, am given to all my children which are named of him.

19. Come unto me, all ye that be desirous of me, and fill yourselves with my fruits.

20. For my memorial is sweeter than honey, and mine inheritance than the honey-comb.

"Out of the mouth of the ALMIGHTY proceeded I. "Before any created being knew that it existed, I "was. If there be in Heaven a light never to be "extinguished, I commanded it to arise. If the "Earth is involved in clouds, I commanded the va- "pour to ascend. The lofty places of the Earth are "my habitation; and my throne is in the cloudy "pillar. In solitude I make the round of the starry "Heavens; I plunge to the bottom of the vast abyss, "and walk majestic under the waves of the Sea. On "every land the sole of my foot alights, and I travel "from shore to shore. Wherever I appear, my so- "vereignty is acknowledged. In the greatness of "my might, I have subdued the heart of the humble "and of the proud. I have sought for a place of "habitation in the midst of them; but I will fix "mine abode only in the heritage of JEHOVAH... I "have lifted up myself as a cedar upon Mount Le- "banon, and as the cypress tree on the hills of Zion. "My branches have been exalted to the Heavens, "like the palm-trees of Kadish, and as the blossoms "of the rose which surround Jericho. I am beauti- "ful as the olive on the brow of the hill, and ma-

"jestic

"jestic as the plane-tree, in an open place, by the "fountains of water....I have extended my boughs "as the terebinthus; my branches are branches of "honour and grace. I have put forth, as the vine, "blossoms of the sweetest perfume, and my buds "have produced the fruits of glory and abundance. "I am the parent of holy love, of fear, of know-"ledge, and of sacred hope; I alone point out the "road that is safe and easy; and unfold truths that "give delight; in me reposes all the expectation of "life and virtue. Come to me, all ye who love me; "and my never-ceasing productions shall fill you "with rapture; for my spirit is sweeter than honey, "and my distribution of it far superior to the cells "of the honeycomb."

This feeble translation is after the Latin prose version, itself a translation from the Greek, and it again from the Hebrew. It is not to be doubted, therefore, that in passing through so many strainers, much of the grace of the original must have evaporated. But even as it is, it possesses a decided superiority, in respect of pleasantness and sublimity of imagery, over the verses of *Lucretius* who appears to have borrowed his principal beauties from this passage. And here I dismiss that Poet; the exordium of his performance is a complete refutation of it.

Pliny takes the directly opposite course. In the very threshold of his Natural History, he affirms that there is no GOD, and the whole of that work is an elaborate demonstration of the being of GOD. His authority must necessarily be of considerable weight, as it is not that of a Poet, to whom opinions are a matter

matter of indifference, provided he can produce a striking picture; nor that of a sectary, obstinately determined to support a party, whatever violence may be done to conscience; nor, finally, that of a flatterer, making his court to vicious Princes. *Pliny* wrote under the virtuous *Titus*, and has dedicated his book to him. He carries to such a height the love of truth, and contempt of the glory of the age in which he lived, as to condemn the victories of *Cesar*, in Rome itself, and when addressing a Roman Emperor. He is replete with humanity and virtue. He frequently exposes to censure the cruelty of masters to their slaves, the luxury of the great, nay, the dissolute conduct of several Empresses. He sometimes pronounces the panegyric of good men; and exalts even above the inventors of arts, persons who have rendered themselves illustrious by their continency, their modesty, and their piety.

His Work, in other respects, is a combination of brilliancies. It is a real Encyclopedia, which contains, as it ought, the history of the knowledge, and of the errors of his time. These last are sometimes imputed to him very unjustly, for he frequently brings them forward merely in the view of refuting them. But he has been abused by the Physicians, and the Apothecaries, who have extracted the greatest part of their prescriptions from him, because he finds fault with their conjectural art, and with their systematic spirit. He abounds, besides, in curious information, in profound views, and interesting traditions; and, what renders his performance invaluable, he uniformly expresses himself in a picturesque manner.

manner. With all this taste, judgment, and knowledge, *Pliny* is an atheist. Nature, from whose capacious stores he has derived such various intelligence, may address him in the words of *Cesar* to *Brutus: What, you too, my son!*

Pliny I love, and I esteem: and if I may be permitted to say in his justification, what I think of his immortal Work, I believe it to be falsified in the passage where he is made to reason as an atheist. All his commentators agree in thinking, that no one Author has suffered more from the unfaithfulness of transcribers than he has done; and this to such a degree, that copies of his Natural History exist, in which there are whole chapters entirely different. Consult, among others, what *Mathiola* says on the subject, in his commentaries on *Dioscorides*. I shall here take occasion to observe, that the Writings of the Ancients, on their way to us, have passed through more than one unfaithful language, and what is much worse, through more than one suspicious hand. They have met with the fate of their monuments, among which their temples have been most of all degraded. Their books have, in like manner, been mutilated chiefly in those passages which are favourable to religion, or the reverse. An instance of this we have in the transcription of *Cicero*'s Treatise *on the Nature of the Gods*, in which the objections against Providence are omitted.

Montagne upbraids the first Christians with having suppressed, on account of four or five articles which contradicted their creed, a part of the Works of *Cornelius Tacitus*, "though," says he, "the Em-

"peror

"peror *Tacitus*, his relation, had by express edicts "furnished all the libraries in the World with "them."*

In our own days, do we not see how every party exerts itself to run down the reputation, and the opinions of the party which opposes it? Mankind is, in the hands of religion and philosophy, like the old man in the fable, between two dames of different ages. They had both a mind to trim his locks, each in her own way. The younger picked carefully out all the white hairs, which she could not bear; the old one, for an opposite reason, as carefully removed the black: the consequence was, his head was speedily reduced to complete baldness.

It is impossible to adduce a more satisfactory demonstration of this ancient infidelity of the two parties, than an interpolation to be found in the Writings of *Flavius Josephus*, who was contemporary with *Pliny*. He is made to say, in so many words, that the Messiah was just born; and he continues his narration, without referring so much as once to this wonderful event, to the end of a voluminous history. How can it be believed that *Josephus*, who frequently indulges himself in a tedious detail of minute circumstances, relating to events of little importance, should not have reverted a thousand and a thousand times, to a birth so deeply interesting to his Nation, considering that it's very destiny was involved in that event, and that even the destruction of Jerusalem was only one of the consequences of the death of JESUS CHRIST? He, on the contrary, perverts the meaning

* Essays, book ii. chap. xix.

of

of the prophecies which announce Him, applying them to *Vespasian* and to *Titus ;* for he, as well as the other Jews, expected a Messiah triumphant. Besides, had *Josephus* believed in CHRIST, would he not have embraced his Religion ?

For a similar reason, is it credible that *Pliny* should commence his Natural History with denying the existence of GOD, and afterwards fill every page of it, with expatiating on the wisdom, the goodness, the providence, the majesty of Nature ; on the presages and pre-monitions, sent expressly from the Gods ; and even on the miracles divinely operated through the medium of dreams ?

Certain savage tribes have likewise been adduced as affording examples of atheism, and every sequestered corner of the Globe has been for this purpose explored. But obscure remote tribes were no more intended to serve as an example to the human race, than certain mean and obscure families among ourselves, could be proposed as proper models to the Nation ; especially when the professed object is to support, by authority, an opinion which is necessarily subversive of all society. Besides, such assertions are absolutely false. I have read the history of the voyages from which they are extracted. The travellers acknowledge that they had but a transient view of those people, and that they were totally unacquainted with their languages. They took it for granted that there could be no religion among them, because they saw no temples ; as if any other temple were necessary to a belief in God than the temple of Nature ! These same travellers likewise contradict them-

themselves; for they relate, that those Nations, whom they elsewhere represent as destitute of all religion, make obeisance to the Moon, at the change, and when full, by prostrating themselves to the Earth, or by lifting up their hands to Heaven: that they pay respect to the memory of their forefathers, and place viands on their tombs. The immortality of the soul, admitted in whatever manner you will, necessarily supposes the existence of GOD.

But if the first of all truths stood in need of testimony from men, we could collect that of the whole Human Race, from geniuses the most exalted, down to the lowest state of ignorance. This unanimity of testimony is of irresistible weight; for it is impossible that such a thing should exist on the Earth as universal error.

Hear what the sage *Socrates* said to *Euthydemus*, who expressed a wish to have a complete assurance that the Gods existed:

"Know, assuredly, that I told you the truth,* "when I declared the existence of the Gods, and "asserted that Man is their peculiar care: but ex- "pect not that they should assume a sensible appear- "ance, and present themselves before you; satisfy "yourself with the contemplation of their works, "and with paying them adoration; remember that "this is the way in which they make themselves "known unto men: for of all the heavenly powers "whose liberality towards us is so great, no one ever "becomes the visible dispenser of his own bounty; "and the great GOD himself, who created the Uni-

* *Xenophon*'s Memorable Things of *Socrates*, book iv.

" verse, and who sustains that vast fabric, all the parts " of which are adjusted in perfect beauty and good- " ness; He who constantly watches over it, and takes " care that it shall not wax old, and fall into decay " through length of duration, but always subsist in " immortal vigour;* He who also, with power un- " controlable

* *Socrates* had made a particular study of Nature; and although his judgment, respecting the duration and preservation of her works may be contrary to that of our philosophy, which considers the Globe of the Earth, especially, as in a progressive state of ruin, it is in perfect harmony with that of the Holy Scriptures, which give us positive assurances that GOD upholds it, and with our own experience on the subject, as I have already shewn. We have little reason to undervalue the physical knowledge of the Ancients, except in so far as it was reduced to system. We ought to recollect that they had made most of the discoveries which the Moderns boast as all their own. The Tuscan Philosophers understood the art of conjuring down the thunder. Good King *Numa* made experiments on this subject. *Tullus Hostilius* took a fancy to imitate, but fell a victim to his attempt, from want of understanding how to conduct the experiments in a proper manner. (Consult *Plutarch*). *Philolaüs*, the Pythagorean, advanced long before *Copernicus*, that the Sun was the centre of the World; and before *Christopher Columbus*, that our Earth consisted of two Continents, that on which we are placed, and the one opposite to it. Several Philosophers of Antiquity maintained, that comets were stars which pursued a regular course. *Pliny* himself says, that they all move in a northerly direction, which is generally true. It is not yet however, two hundred years, since comets were believed in Europe, to be vapours which caught fire in the intermediate regions of the air. The general belief, about that period, likewise was, that the Sea furnished a supply of water to the fountains and rivers, by a process of filtration through the pores of the Earth, though it is said in a hundred passages of Scripture, that by the rains their sources are kept flowing. Of this we now have the most complete conviction, by accurate observations on the evaporations of the Ocean.

" controlable, constrains the whole to obey his will;
" and that with a promptitude which far surpasses
" our imagination: HE, I say, is abundantly visible
" in all those wonders of which He is the AUTHOR.
" But let our eyes attempt to penetrate to his throne,
" and to contemplate all these mighty operations in
" their source, here he must be ever invisible.

" Observe, for a moment, that the Sun, who seems
" designedly exposed to the view of the whole Crea-
" tion, permits no one, however, steadily to behold
" him: the man who dares to make the rash attempt
" is instantly punished with blindness. Nay, more,
" every instrument employed by the Gods is invisible.
" The thunder is darted from on high; it dashes in
" pieces every thing it meets; but no one can see it
" fall, can see it strike, can see it return. The winds
" are invisible, though we see well the ravages which
" they every day commit, and feel their influence the
" moment that they begin to blow. If there be any
" thing in Man that partakes of the divine Nature,
" it is his soul. There can be no doubt that this is
" his directing, governing principle, nevertheless it is

Ocean. The monuments which the Ancients have transmitted to us in Architecture, Sculpture, Poetry, Tragedy, History, will ever serve as models to us. We are indebted to them besides for the invention of almost all the other Arts; and it is presumable that these Arts had the same superiority over ours, which their liberal Arts have. As to the natural Sciences, they have not left us any object of comparison; besides, the Priests, who were chiefly employed in the cultivation of them, carefully concealed their knowledge from the People. There is little room to doubt, that they possessed, on this subject, an illumination far transcending ours. Consult what the judicious Sir *William Temple* has said of the magic of the ancient Egyptians.

"impossible to see it. From all this be instructed "not to despise things invisible: be instructed to "acknowledge their powers in their effects, and to "honour the DEITY."

Newton, who pursued his researches into the Laws of Nature so profoundly, never pronounced the name of GOD without moving his hat, and otherwise expressing the most devout respect. He took pleasure in recalling this sublime idea, even in his moments of conviviality, and considered it as the natural bond of union among all Nations. *Corneille le Bruyn*, the Dutch painter, relates, that happening to dine one day at his table, in company with several other foreigners, *Newton*, when the desert was served up, proposed a health to the Men of every Country who believe in GOD. This was drinking the health of the Human Race. Is it possible to conceive that so many Nations, of languages and manners so very different, and, in many cases, of an intelligence so contracted, should believe in GOD, if that belief were the result of some tradition, or of a profound metaphysical disquisition? It arises from the spectacle of Nature simply. A poor Arabian of the Desert, ignorant as most of the Arabians are, was one day asked, How he came to be assured that there was a God? "In the "same way," replied he, "that I am able to tell, by "the print impressed on the sand, whether it was a "man or a beast which passed that way."*

It is impossible for Man, as has been said, to imagine any form, or to produce a single idea of which the model is not in Nature. He expands his reason

* Travels through Arabia, by Mons. *d'Arvieux*.

only

only on the reasons which Nature has supplied. GOD must, therefore, necessarily exist, were it but for this, that Man has an idea of Him. But if we attentively consider, that every thing necessary to Man, exists in a most wonderful adaptation to his necessities, for the strongest of all reasons, GOD likewise must exist, He who is the universal adaptation of all the societies of the Human Race.

But I should wish to know, In what way the person who doubts of his existence, on a review of the Works of Nature, would desire to be assured of it? Do they wish that he should appear under a human form, and assume the figure of an old man, as he is painted in some of our churches? They would say, This is a man. Were he to invest himself with some unknown and celestial form, Could we in a human body support the sight? The complete and unveiled display of even a single one of his works on the Earth, would be sufficient to confound our feeble organs. For example, if the Earth wheels around it's axis, as is supposed, there is not a human being in existence, who, from a fixed point in the Heavens, could view the rapidity of it's motion without horror; for he would behold rivers, oceans, kingdoms, whirling about under his feet, with a velocity almost thrice as great as a cannon ball. But even the swiftness of this diurnal rotation is a mere nothing: for the rapidity with which the Globe describes it's annual circle, and whirls us round the Sun, is seventy-five times greater than that of a bullet shot from the cannon. Were it but possible for the eye to view through the skin, the mechanism of our own body,

the sight would overwhelm us. Durst we make a single movement, if we saw our blood circulating, the nerves pulling, the lungs blowing, the humours filtrating, and all the incomprehensible assemblage of fibres, tubes, pumps, currents, pivots, which sustain an existence at once so frail and so presumptuous?

Would we wish, on the contrary, that GOD should manifest himself in a manner more adapted to his own nature, by the direct and immediate communication of his intelligence, to the exclusion of every intervenient mean?

Archimedes, who had a mind capable of such intense application, as not to be disturbed from his train of thought, by the sack of Syracuse, in which he lost his life, went almost distracted, from the simple perception of geometrical truth, of which he suddenly caught a glimpse. He was pondering, while in the bath, the means of discovering the quantity of alloy which a rascally goldsmith had mixed in *Hiero*'s golden crown; and having found it, from the analogy of the different weight of his own body, when in the water, and out of it, he sprung from the bath, naked as he was, and ran like a madman through the streets of Syracuse, calling out *I have found it! I have found it!*

When some striking truth, or some affecting sentiment, happens to lay hold of the audience at a theatre, you see some melted into tears, others almost choked with an oppressed respiration, others quite in a transport, clapping their hands, and stamping with their feet; the females in the boxes actually fainting away. Were these violent agitations of spirit to go

on progressively but for a few minutes only, the persons subject to them might lose their reason, perhaps their life. What would be the case, then, if the Source of all truth, and of all feeling, were to communicate himself to us in a mortal body? GOD has placed us at a suitable distance from his infinite Majesty; near enough to have a perception of it, but not so near as to be annihilated by it. He veils his intelligence from us under the forms of matter; and He restores our confidence respecting the movements of the material world by the sentiment of his intelligence. If at any time he is pleased to communicate himself in a more intimate manner, it is not through the channel of haughty Science, but through that of modest Virtue. He discloses himself to the simple, and hides his face from the proud.

"But," it is asked, "What made GOD? Why "should there be a God?" Am I to call in question his existence, because I am incapable of comprehending his origin? This style of reasoning would lead us to conclude, that man does not exist: for, Who made men? Why should there be men? Why am I in the world in the eighteenth century? Why did I not arrive in some of the ages which went before? and, Wherefore should I not be here in those which are to come? The existence of GOD is at all times necessary, and that of Men is only contingent. Nay, this is not all; the existence of Man is the only existence apparently superfluous in the order established upon the Earth. Many islands have been discovered without inhabitants, which presented abodes the most enchanting, from the disposition of the val-

leys, of the waters, of the woods, of the animals. Man alone deranges the plans of Nature: he diverts the current from the fountain; he digs into the side of the hill; he sets the forest on fire; he massacres without mercy every thing that breathes; every where he degrades the Earth, which could do very well without him.

The harmony of this Globe would be partially destroyed, perhaps entirely so, were but the smallest, and seemingly most insignificant, genus of plants to be suppressed; for it's annihilation would leave a certain space of ground destitute of verdure, and thereby rob of it's nourishment the species of insect which there found the support of life. The destruction of the insect, again, would involve that of the species of bird, which in these alone finds the food proper for their young; and so on to infinity. The total ruin of the vegetable and animal kingdoms might take it's rise from the failure of a single moss, as we may see that of an edifice commence in a small crevice. But if the Human Race existed not, it would be impossible to suppose that any thing had been deranged: every brook, every plant, every animal would always be in it's place. Indolent and haughty Philosopher, who presumest to demand of Nature, wherefore there should be a God, why demandest thou not rather wherefore there should be men?

All his Works speak of their AUTHOR. The plain which gradually escapes from my eye, and the capacious vault of Heaven which encompasses me on every side, convey to me an idea of his immensity; the fruits suspended on the bough within reach of my hand

hand, announce his providential care; the constant revolution of the seasons displays his wisdom; the variety of provision which his bounty makes, in every climate, for the wants of every thing that lives, the stately port of the forests, the soft verdure of the meadow, the grouping of plants, the perfume and enamel of flowers, an infinite multitude of harmonies, known and unknown, are the magnificent languages which speak of HIM to all men, in a thousand and a thousand different dialects.

Nay, the very order of Nature is superfluous: GOD is the only Being whom disorder invokes, and whom human weakness announces. In order to attain the knowledge of its attributes, we need only to have a feeling of our own imperfections. Oh! how sublime is that prayer,* how congenial to the heart of Man, and still in use among People whom we presume to call Savages! "O Eternal! Have mercy "upon me because I am passing away: O Infinite! "because I am but a speck: O Most mighty! be- "cause I am weak: Oh Source of Life! because I "draw nigh to the grave: O Omniscient! because "I am in darkness: O All-bounteous! because I "am poor: O All-sufficient! because I am nothing."

* See *Flacour*'s History of the Island of Madagascar, chap xliv. page 182. You will there find this prayer, embarrassed with many circumlocutions, but conveying the meaning which I have expressed. It is wonderfully strange that Negroes should have discovered all the attributes of Deity, in the imperfections of Man. It is with just reason that the Divine Wisdom has said of itself, that it rested on all Nations: *Et in omni terra steti, & in omni populo: & in omni populo primatum habui.* In every land, among every people, I fixed my station; and obtained the chief place amidst the Nations. ECCLES. chap. xxiv.

Man has given nothing to himself: he has received all. And "He who planted the ear, shall He not "hear? He who formed the eye, shall He not see? "He who teacheth Man knowledge, shall not He "know?" I should consider myself as offering an insult to the understanding of my Reader, and should derange the plan of my Work, were I to insist longer on the proofs of the existence of GOD. It remains that I reply to the objections raised against his goodness.

It needs must be, we are told, that the God of Nature should differ from the God of Religion, for their Laws are contradictory. This is just the same thing with saying, that there is one God of metals, another God of plants, and another of animals, because all these beings are subjected to laws peculiar to themselves. Nay, in all the kingdoms of Nature the genera and the species have other Laws besides, which are peculiar to them, and which, in many cases, are in opposition among themselves; but those different Laws constitute the happiness of each species in particular; and they concur, in one grand combination, in a most admirable manner, to promote the general felicity.

The Laws which govern Man are derived from the same plan of Wisdom which has constructed the Universe. Man is not a being of a nature perfectly simple. Virtue, which ought to be the great object of his pursuit on the Earth, is an effort which he makes over himself for the good of Mankind, in the view of pleasing GOD only. It proposes to him, on the one hand, the Divine Wisdom as a model; and

presents

presents to him, on the other, the most secure and unerring path to his own happiness. Study Nature, and you will perceive that nothing can be more adapted to the felicity of Man, and that Virtue carries her reward in her bosom, even in this world. A man's continency and temperance secure his health; contempt of riches and glory insures his repose: and confidence in GOD supports his fortitude. What can be more adapted to the condition of a creature exposed to so much misery, than modesty and humility? Whatever the revolutions of life may be, that man has no farther fear of falling, who has taken his seat on the lowest step.

Let us not complain that GOD has made an unfair distribution of his gifts, when we see the abundance and the state in which some bad men live. Whatever is on the earth most useful, most beautiful, and the best, is within the reach of every man. Obscurity is much better than glory, and virtue than talents. The light of the Sun, a little field, a wife and children, are sufficient to supply a constant succession of pleasures to him. Must he have luxuries too? A flower presents him colours more lovely than the pearl dragged from the abysses of the Ocean; and a burning coal on his hearth has a brighter lustre, and beyond all dispute is infinitely more useful, than the famous gem which glitters on the head of the Grand Mogul.

After all, What did GOD owe to every man? Water from the fountain, a little fruit, wool to clothe him, as much land as he is able to cultivate with his own hands. So much for the wants of his body. As

to

to those of the soul, it is sufficient for him to possess, in infancy, the love of his parents; in maturity, that of his wife; in old age, the gratitude of his children; at all seasons, the good-will of his neighbours, the number of whom is restricted to four or five, according to the extent and form of his domain; so much knowledge of the Globe as he can acquire by rambling about for half a day, so as to get home to his own bed at night, or, at most, to the extremity of his domestic horizon; such a sense of Providence as Nature bestows on all men, and which will spring up in his heart fully as well after he has made the circuit of his own field, as after returning from a voyage round the World.

With corporeal enjoyments, and mental gratifications like these, he ought to be content; whatever he desires beyond these, is above his wants, and inconsistent with the distributions of Nature. It is impossible for him to acquire superfluity, but by the sacrifice of some necessary; public consideration he must purchase at the price of domestic happiness; and a name in the world of science by renouncing his repose. Besides those honours, those attendants, those riches, that submission which men so eagerly hunt after, are desired unjustly. A man cannot obtain them but by plundering and enslaving his fellow-citizens. The acquisition of them exposes to incredible labour and anxiety, the possession is disturbed by incessant care, and privation tears the heart with regret. By pretended blessings such as these, health, reason, conscience, all is depraved and lost. They are as fatal to Empires as to families: it was neither by labour,

bour, or indigence; no, not even by wars, that the Roman Empire fell into ruin; but by the accumulated pleasures, knowledge, and luxury of the whole Earth.

Virtuous persons, in truth, are sometimes destitute not only of the blessings of Society, but of those of Nature. To this I answer, that their calamities frequently are productive of unspeakable benefit to them. When persecuted by the World, they are frequently, they are usually, incited to engage in some illustrious career. Affliction is the path of great talents, or, at least, that of great virtues, which are infinitely preferable. "It is not in your power," said Marcus Aurelius, "to be a Naturalist, a Poet, an "Orator, a Mathematician,; but it is in your power "to be a virtuous man, which is best of all."

I have remarked, besides, that no tyranny starts up of whatever kind, respecting either facts or opinions, but a rival tyranny instantly starts up in opposition, which counterbalances it; so that virtue finds a protection from the very efforts made by vice to oppress and crush it. The good man frequently suffers: it is admitted; but if Providence were to interpose for his relief, as soon as he needed it, Providence would be at his disposal; in other words, Man would have the direction of his MAKER. Besides, virtue, in this case, would merit no praise: but rarely does it happen that the virtuous man does not sooner or later behold the downfal of his tyrant. Or supposing, the worst that can happen, that he falls a victim to tyranny, the boundary of all his woes is death. GOD could owe Man nothing. He called him from non-

existence

existence into life; in withdrawing life, He only resumes what He gave: we have nothing whereof to complain.

An entire resignation to the will of GOD ought in every situation, to sooth the soul to peace. But if the illusions of a vain world should chance to ruffle our spirit, let me suggest a consideration which may go far toward restoring our tranquillity. When any thing in the order of Nature bears hard upon us, and inspires mistrust of it's AUTHOR, let us suppose an order of things contrary to that which galls us, and we shall find a multitude of consequences resulting from this hypothesis, that would involve much greater evils than those of which we complain. We may employ the contrary method, when some imaginary plan of human perfection would attempt to seduce us. We have but to suppose it's existence, in order to see innumerable absurd consequences springing up out of it. This two-fold method, employed frequently by Socrates, rendered him victorious over all the sophists of his time, and may still be successfully employed to confute those of the age in which we live. It is at once a rampart which defends our feeble reason, and a battery which levels with the dust all the delusion of human opinions. If you wish to justify the order of Nature, it is sufficient to deviate from it; and, in order to refute all human systems, nothing more is necessary than to admit them.

For example, complaints are made of death: but if men were not to die, what would become of their posterity? Long before now there would not have been room for them on the face of the Earth. Death, therefore,

therefore is a benefit. Men complain of the necessity of labouring: but unless they laboured, How could they pass their time? The reputedly happy of the age, those who have nothing to do, are at a loss how to employ it. Labour, therefore, is a benefit. Men envy the beasts the instinct which guides them: but if, from their birth, they knew, like them, all that they ever are to know, What should they do in the World? They would saunter through it without interest, or without curiosity. Ignorance, therefore, is a benefit.

The other ills of Nature are equally necessary. Pain of body, and vexation of spirit, which so frequently cross the path of life, are barriers erected by the hand of Nature to prevent our deviating from her Laws. But for pain, bodies would be broken to pieces on the slightest shock: but for chagrin, so frequently the companion of our enjoyments, the mind would become the victim of every sickly appetite. Diseases are the efforts of temperament to purge off some noxious humour. Nature employs diseases not to destroy the body, but to preserve it. In every case, it is the consequence of some violation of her Laws, physical or moral. The remedy is frequently obtained by leaving her to act in her own way. The regimen of aliments restores our health of body, and that of men, tranquillity of mind. Whatever may be the opinions which disturb our repose in Society, they almost always vanish into air in Solitude. Sleep itself simply dispels our chagrin more gently and more infallibly than a book of morals. If our distresses are immoveable, and such as break our rest, they may

may be mitigated by having recourse to GOD. Here is the central point toward which all the paths of human life converge. Prosperity, at all seasons, invites us to his presence, but adversity leaves us no choice. It is the means which GOD employs to force us to take refuge in himself alone. But for this voice, which addresses itself to every one of us, we should soon forget Him, especially in the tumult of great cities, where so many fleeting interests clash with those which are eternal, and where so many second causes swallow up all attention to the FIRST.

As to the evils of Society, they are no part of the plan of Nature; but those very evils demonstrate the existence of another order of things: for is it natural to imagine, that the BEING good and just, who has disposed every thing on the Earth to promote the happiness of Man, will permit him to be deprived of it, without punishing the wretch who dared to counteract his gracious designs? Will He do nothing in behalf of the virtuous, but unfortunate man, whose constant study was to please Him, when He has loaded with blessings so many miscreants who abuse them? After having displayed a bounty which has met with no return, will he fail in executing necessary justice?

"But," we are told, "every thing dies with us. "Here we ought to believe our own experience; "we were nothing before our birth, and we shall be "nothing after death." I adopt the analogy; but if I take my point of comparison from the moment I was nothing and when I came into existence, What becomes of this argument? Is not one positive proof

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better than all the negative proofs in the world? You conclude from an unknown past to an unknown future, to perpetuate the nothingness of Man; and I, for my part, deduce my consequence from the present, which I know, to the future, which I do not know, as an assurance of this future existence. I proceed on the presumption of a goodness and a justice to come, from the instances of goodness and justice which I see actually diffused over the Universe.

Besides, if we have, in our present state, the desire and the presentiment only of a life to come; and if no one ever returned thence to give us information concerning it, the reason is, a proof more sensible would be inconsistent with the nature of our present life on the Earth. Evidence on this point must involve the same inconveniences with that of the existence of GOD. Were we assured by some sensible demonstration, that a world to come was prepared for us, I have the fullest conviction that all the pursuits of this world would from that instant be abandoned. This perspective of a divine felicity here below, would throw us into a lethargic rapture.

I recollect that on my return to France, in a vessel which had been on a voyage to India, as soon as the sailors had perfectly distinguished the land of their native country, they became, in a great measure, incapable of attending to the business of the ship. Some looked at it wistfully, without the power of minding any other object; others dressed themselves in their best clothes, as if they had been going that moment to disembark; some talked to themselves, and others wept. As we approached, the disorder of

their minds increased. As they had been absent several years, there was no end to the admiration of the verdure of the hills, of the foliage of the trees, and even of the rocks which skirted the shore, covered over with sea-weeds and mosses; as if all these objects had been perfectly new to them. The church spires of the villages where they were born, which they distinguished at a distance up the country, and which they named one after another, filled them with transports of delight. But when the vessel entered the port, and when they saw on the quays, their friends, their fathers, their mothers, their wives, and their children, stretching out their arms to them with tears of joy, and calling them by their names, it was no longer possible to retain a single man on board; they all sprung ashore, and it became necessary, according to the custom of the port, to employ another set of mariners to bring the vessel to her moorings.

What then would be the case, were we indulged with a sensible discovery of that Heavenly Country, inhabited by those who are most dear to us, and who alone are most worthy of our sublime affections? All the laborious and vain solicitudes of a present life would come to an end. The passage from the one world to the other being in every man's power, the gulf would be quickly shot: but nature has involved it in obscurity, and has planted doubt and apprehension to guard the passage.

It would appear, we are told by some, that the idea of the immortality of the soul, could arise only from the speculations of men of genius, who, considering the combination of this Universe, and the connection

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which present scenes, have with those which preceded them, must have thence concluded, that they had a necessary connection with futurity; or else that this idea of immortality was introduced by Legislators, in a state of polished society, as furnishing a distant hope tending to console mankind under the pressure of their political injustice. But if this were the case, How could it have found it's way into the deserts, and entered the head of a Negro, of a Caraib, of a Patagonian, of a Tartar? How could it have been diffused at once, over the islands of the South Seas, and over Lapland; over the voluptuous regions of Asia, and the rude climates of North-America; among the inhabitants of Paris, and those of the new Hebrides? How is it possible that so many Nations, separated by vast Oceans, so different in manners and in language, should have unanimously adopted one opinion; Nations which frequently affect, from national animosity, a deviation from the most trivial customs of their neighbours?

All believe in the immortality of the soul. Whence could they have derived a belief so flatly contradicted by their daily experience? They every day see their friends die; but the day never comes when any one re-appears. In vain do they carry victuals to their tombs; in vain do they suspend with tears, on the boughs of the adjoining trees, the objects which in life were most dear to them; neither these testimonies of an inconsolable friendship, nor the vows of conjugal affection challenged by their drooping mates, nor the lamentations of their dear children, poured out over the earth which covers their remains

can bring them back from the land of shadows. What do they expect for themselves from a life to come, who express all this unavailing regret over the ashes of their departed favourites? There is no propect so inimical to the interests of most men; for some, having lived a life of fraud or of violence, have reason to apprehend a state of punishment; others, having been oppressed in this world, might justly fear, that the life to come was to be regulated conformably to the same destiny which presided over that which they are going to leave.

Shall we be told, It is pride which cherishes this fond opinion in their breasts? What, is it pride that induces a wretched Negro in the West-Indies to hang himself, in the hope of returning to his own country where a second state of slavery awaits him? Other Nations, such as the islanders of Otaheite, restrict the hope of this immortality to a renovation of precisely the same life which they are going to leave. Ah! the passions present to man far different plans of felicity; and the miseries of his existence, and the illumination of his reason, would long ago have destroyed the life that is, had not the hope of a life to come been, in the human breast, the result of a supernatural feeling.

But wherefore is man the only one of all animals subjected to other evils than those of Nature? Wherefore should he have been abandoned to himself, disposed as he is to go astray? He is, therefore, the victim of some malignant Being.

It is the province of Religion to take us up where Philosophy leaves us. The nature of the ills which we

we endure unfolds their origin. If man renders himself unhappy, it is because he would himself be the arbiter of his own felicity. Man is a god in exile. The reign of *Saturn*, the Golden Age, *Pandora*'s box, from which issued every evil, and at the bottom of which hope alone remained; a thousand similar allegories, diffused over all Nations, attest the felicity, and the fall, of a first Man.

But there is no need to have recourse to foreign testimonies. We carry the most unquestionable evidence in ourselves. The beauties of Nature bear witness to the existence of GOD, and the miseries of Man, confirm the truths of Religion. There exists not a single animal but what is lodged, clothed, fed, by the hand of Nature, without care, and almost without labour. Man alone, from his birth upward, is overwhelmed with calamity. First, he is born naked; and is possessed of so little instinct, that if the mother who bear him were not to rear him for several years, he would perish of hunger, of heat, or of cold. He knows nothing but from the experience of his parents. They are under the necessity of finding him a place where to lodge, of weaving garments for him, of providing his food for eight or ten years. Whatever encomiums may have been passed on certain countries for their fertility, and the mildness of their climate, I know of no one in which subsistence of the simplest kind does not cost Man both solicitude and labour. In India, he must have a roof over his head, to shelter him from the heat, from the rains, and from the insects. There too he must cultivate rice, weed it, thresh it, shell it, dress it. The ba-

nana, the most useful of all the vegetables of those countries, stands in need of being watered, and of being hedged round, to secure it from the attacks of the wild beasts by night. Magazines must likewise be provided, for the preservation of provisions during those seasons when the Earth produces nothing. When Man has thus collected around him every thing necessary to a quiet and comfortable life, ambition, jealousy, avarice, gluttony, incontinency, or languor, take possession of his heart. He perishes almost always the victim of his own passions. Undoubtedly to have sunk thus below the level of the beasts, Man must have aspired at an equality with the DEITY.

Wretched mortals! Seek your happiness in Virtue, and you will have no ground of complaint against Nature. Despise that useless knowlege, and those unreasonable prejudices, which have corrupted the Earth, and which every age subverts in it's turn. Love those Laws which are eternal. Your destiny is not abandoned to chance, nor to mischievous demons. Recall those times, the recollection of which is still fresh among all Nations. The brute creation every where found the means of supporting life; Man alone had neither aliment, nor clothing, nor instinct.

Divine wisdom left Man to himself, in order to bring him back to GOD. She scattered her blessings over the whole Earth, that in order to gather them, he might explore every different region of it; that he might expand his reason by the inspection of her works, and that he might become enamoured of her from a sense of her benefits. She placed between

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herself and him, harmless pleasures, rapturous discoveries, pure delights, and endless hopes, in order to lead him to herself, step by step, through the path of knowledge and happiness. She fenced his way on both sides, by fear, by languor, by remorse, by pain, by all the ills of life, as boundaries destined to prevent him from wandering and losing himself. The mother thus scatters fruit along the ground to induce her children to learn to walk; she keeps at a little distance; smiles to him, calls him, stretches out her arms towards him: but if he happens to fall, she flies to his assistance, she wipes away his tears, and comforts him.

Thus Providence interposes for the relief of Man, supplying his wants in a thousand extraordinary ways. What would have become of him in the earliest ages, had he been abandoned to his own reason, still unaided by experience? Where found he corn, which at this day constitutes a principal part of the food of so many Nations, and which the Earth, while it spontaneously produces all sorts of plants, no where exhibits? Who taught him agriculture, an art so simple, that the most stupid of Mankind is capable of learning it, and yet so sublime, that the most intelligent of animals never can pretend to practise it? There is scarcely an animal but what supports it's life by vegetables, no one but what has daily experience of their re-production, and which does not employ, in quest of those that suit them, many more combinations than would have been necessary for re-sowing them.

But, on what did Man himself subsist, till an *Isis* or a *Ceres* revealed to him this blessing of the skies?

Who shewed him, in the first ages of the World, the original fruits of the orchard, scattered over the forest, and the alimentary roots concealed in the bosom of the Earth? Must he not, a thousand times, have died of hunger before he had collected a sufficiency to support life, or perished by poison, before he had learned to select, or sunk under fatigue or restlessness, before he had formed round his habitation grass-plots, and arbours? This art, the image of creation, was reserved for that Being alone who bare the impression of the Divinity.

If Providence had abandoned Man to himself, on proceeding from the hands of the Creator, What would have become of him? Could he have said to the plains: Ye unknown forests, shew me the fruits which are my inheritance? Earth, open, and disclose in the roots buried under thy surface, my destined aliment? Ye plants, on which my life depends, manifest to me your qualities, and supply the instinct which Nature has denied? Could he have had recourse, in his distress to the compassion of the beasts, and, ready to perish with hunger, have said to the cow: Take me into the number of thy children, and let me share, with thy offspring, the produce of one of thy superfluous teats? When the breath of the North wind made him shiver with cold, would the wild goat and timid sheep have run at his call to warm him with their fleeces? Wandering, without a protector, and without an asylum, when he heard by night the howlings of ferocious animals demanding their prey, Could he have made supplication to the generous dog, and said to him: Be thou my defender,

fender, and I will make thee my slave? Who could have subjected to his authorityso many animalswhich stood in no need of him, which surpassed him in cunning, and speed, in strength, unless the hand which notwithstanding his fall, destined him still to empire, had humbled their heads to the obedience of his will?

How was it possible for him, with a reason less infallible than their instinct, to raise himself up to the Heavens, to measure the course of the stars, to cross the Ocean, to call down the thunder, to imitate most of the Works and appearances of Nature? We are struck with astonishment at these things now; but I am much rather astonished, that a sense of Deity should have spoken to his heart long before a comprehension of the Works of Nature, had perfected his understanding. View him in the state of nature engaged in perpetual war with the elements, with beasts of prey, with his fellow creatures, with himself: frequently reduced to situations of subjection which no other animal could possibly support; and he is the only being who discovers, in the very depth of misery, the character of infinity, and the restlessness of immortality. He erects trophies; he engraves the record of his achievements on the barks of trees; he celebrates his funeral obsequies, and puts reverence on the ashes of his forefathers, from whom he has received an inheritance so fatal.

He is incessantly agitated by the rage of love or of vengeance. When he is not the victim of his fellow-men, he is their tyrant: and he alone knows that Justice and Goodness govern the World, and that

Virtue

Virtue exalts Man to Heaven. He receives from his cradle none of the presents of Nature, no soft fleece, no plumage, no defensive armour, no tool, for a life so painful and so laborious; and he is the only being who invites the Gods to his birth, to his nuptials, and to his funeral obsequies.

However far he may have been misled by extravagant opinions, as often as he is struck by unexpected bursts of joy or of grief, his soul, by an involuntary movement takes refuge in the bosom of Deity. He cries out: Ah, my GOD! He raises to Heaven suppliant hands, and eyes bathed with tears, in hope of there finding a Father. Ah! the wants of Man bear witness to the providence of a Supreme Being. He has made man feeble and ignorant, only that he may stay himself on his strength, and illuminate himself by his light; and so far is it from being true, that chance or malignant spirits domineer over a World where every thing concurred to destroy a creature so wretched, his preservation, his enjoyments, and his empire, demonstrate, that at all times a beneficent GOD has been the friend and the protector of human life.

STUDY NINTH.

Objections against the Methods of our Reason, and the Principles of our Sciences.

I HAVE displayed, from the beginning of this Work, the immensity of the Study of Nature. I there proposed new plans, to assist us in forming an idea of the order which she has established in all her various kingdoms: but, checked by my own incapacity, all that I could presume to promise was, to trace a slight sketch of what exists in the vegetable order. However, before I proceeded to lay down new principles on this subject, I thought myself called upon to refute the prejudices which the World, and our Sciences themselves, might have diffused over Nature, in the minds of my Readers. I have accordingly exhibited a faint representation of the goodness of Providence to the age in which we live, and the objections which have been raised against it. I have replied to those objections, in the same order in which I have stated them, pointing out, as I went along, the wonderful harmony which prevails in the distribution of the Globe, abandoned as some would have it, to the simple Laws of motion and of chance.

I have presented a new theory of the courses of the Tides, of the motion of the Earth in the Ecliptic, and of

of the Universal deluge: and I am now going to attack, in my turn, the methods of our Reason, and the Elements of our Sciences, before I proceed to lay down some principles, which may indicate to us a certain path to the discovery of Truth.

But let it be understood, that if, in the course of this Work, and particularly in this article, I have combated our natural Sciences, it is only so far as system is concerned: I give them full credit on the side of observation. Besides, I highly respect the persons who devote themselves to thepursuit of Science. I know nothing in the world more estimable, next to the virtuous man, than the man of real knowledge, if however it be possible to separate the Sciences from Virtue. What sacrifices and privations does not the cultivation of them demand! While the herd of Mankind is growing rich and renowned by agriculture, commerce, navigation, and the arts, it has been frequently seen that those who cleared the way for all the rest, lived in indigence themselves, unknown to, and disregarded by, their contemporaries. The man of Science, like the torch, illuminates all around him, and remains himself in obscurity.

I have attacked, then, neither the Learned, whom I honour, nor the Sciences, which have been my consolation through my life: but had time permitted I would have disputed every inch of ground with our methods and our systems. They have thrown us into such a variety of absurd opinions, in every branch of scientific research, that I do not hesitate to affirm our Libraries, at this day, contain more of error than of information. Nay, I could venture to wager, that

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were you to introduce a blind man* into the King's Library, and let him take out any book at a venture, the first page of that book on which he may chance to lay his hand shall contain an error. How many probabilities should I have in my favour, among romance-writers, poets, mythologists, historians, panegyrists, moralists, naturalists of ages past, and metaphysicians of all ages and of all countries? There is in truth a very simple method to check the mischief which their opinions might produce; it is to arrange all the books which contradict themselves, by the side of each other; as these are, in every walk of literature, almost infinite in number, the result of human knowledge, as far as they convey it, will be reduced almost to nothing.

By our very methods of acquiring knowledge, we are deluded into error. First, to succeed in the search of Truth, we ought to be entirely exempted

* The word in the original is, a *Quinze-vingt*. The Quinze-vingt at Paris is a royal foundation of Saint *Louis*, for the relief of *fifteen-score*, that is, three hundred blind persons: hence, in the Parisian phrase, any one, in general, afflicted with the want of sight, is denominated a Quinze-vingt.

The *King's-Library* is another establishment, which reflects the highest honour on the French Government. It was founded by the famous Cardinal *de Richlieu*; who, however, transferred the credit of it to the Prince. The building is erected in the very centre of the Metropolis, and contains a most magnificent collection of books and manuscripts, in all languages, and relative to every art and science; of drawings, models, mathematical instruments, &c. It is opened on certain days of the week, and for a considerable part of the day, for the inspection and use of strangers, as well as natives. And, even in Paris, I saw no petty officer, on duty at the Library, hold out his hand for a fee.—H. H.

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from the influence of passion; and yet, from our earliest infancy, the passions are wilfully set afloat, and thus reason receives an improper bias from the very beginning. This maxim is laid down as the fundamental basis of all conduct, and of all opinion, *Make your fortune.* The effect of this is, we no longer prize any thing but what has some relation to this appetite. Even natural truths vanish out of sight, because we no longer contemplate Nature, except in machines or books.

In order to our believing in GOD, some person of consequence must assure us there is one. If *Fenelon* says it is so, we admit it, because *Fenelon* was preceptor to the Duke of *Burgundy*, an Archbishop, a man of quality, and addressed by the title of My Lord. We are fully convinced of the existence of GOD by the arguments of *Fenelon*, because his credit reflects some upon ourselves. I do not mean to affirm, however, that his virtue contributed nothing to the force of his reasoning: but no farther than as it stands in connection with his reputation and his fortune; for were we to meet this same virtue in a water-porter, it's lustre would fade in our eyes. To no purpose would such a one furnish proofs of the existence of a GOD, more unanswerable than all the speculations of Philosophy, in a life labouring under contempt, hard, poor, laborious, exhibiting uniform probity and fortitude, and passed in perfect resignation to the will of the Supreme: these testimonies so positive are of no consideration at all with us; we estimate their importance from the celebrity which they have acquired. Let some Emperor be disposed

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to adopt the Philosophy of this obscure man, his maxims will be immediately extolled in every book that is published, and quoted in every academical thesis; engraved portraits of the Author, would decorate every panne], and his bust in plaster of Paris grace every chimney; he should be an *Epictetus*, a *Socrates*, a *John James Rousseau*.

But should a period come, in which arose men of as high reputation as these, in favour with powerful Princes, whose interest it might be, that there should be no GOD, and who, in order to make their court to such Princes, denied his existence; from the same effect of our education, which engaged us to believe in GOD, on the faith of *Fenelon*, *Epictetus*, *Socrates*, and *John James Rousseau*, we would renounce our belief, on the credit of the others, being men in such high consideration, and, besides, so much nearer to us. It is thus our education warps us: it disposes us indifferently to preach the Gospel or the Alcoran, according as our interest is concerned in the one or in the other.

Hence arose this maxim so universal and so pernicious: *Primò vivere, deinde philosophari*—"To live "first, and seek wisdom afterward." The man who is not ready to give his life in exchange for wisdom, is unworthy of knowing her. *Juvenal*'s sentiment is much more rational, and deserves rather to be adopted:

Summum crede, nefas vitam præferre pudori;
Et propter vitam, vivendi predere causus.
Imitated thus:
The worst of crimes, believe it, generous youth,
Is to buy life, by selling sacred truth:
Virtue's the gem of life the Sage's store;
But life is death, when honour is no more.

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"The blackest of crimes, believe it, is to prefer "life to honour; and for the sake of a few paltry "years of mere existence, to sacrifice that which "alone makes life desirable."

I say nothing of other prejudices which oppose themselves to the investigation of truth, such as those of ambition, which stimulate every one among us to distinguish himself; and this can hardly be done except in two ways; either by subverting maxims the most undoubted, and the most firmly established, in order to substitute our own in their place; or by making an effort to please all parties, from uniting opinions the most contradictory; and this, taking the two cases together, multiplies the ramifications of error to infinity. Truth has, farther, to encounter a multitude of other obstacles on the part of powerful men who can make an advantage of error. I shall confine myself to those which are to be imputed to the weakness of our reason, and shall examine their influence on our acquirements in natural knowledge.

It is easy to perceive, that most of the Laws which we have presumed to assign to Nature, have been deduced sometimes from our weakness, sometimes from our pride. I shall take a few instances, as they happen to occur to my thoughts, and which are considered as most indubitably certain. For example, we have settled it, that the Sun must be in the centre of the planets, in order to regulate their motion, because we are under the necessity of placing ourselves in the centre of our personal concerns, for the purpose of keeping an eye over them. But if, in the case of the celestial spheres, the centre naturally belongs

longs to the most considerable bodies how comes it about that *Saturn* and *Jupiter*, which greatly exceed uor Globe in magnitude; should be at the extremity of our vortex?

As the shortest road is that which fatigues us least, wehave taken upon us to conclude, that, in like manner, this must be the plan of Nature. Consequently, in order to spare the Sun a journey of about ninety millions of leagues, which he must every day perform, in giving us light, we set the Earth a-spinning round it's own axis. It may be so; but if the Earth revolves round itself, there must be a great difference in the space passed through by two cannon-balls, shot off at the same instant, the one toward the East and the other toward the West; for the first goes along with the motion of the Earth, and the second goes in the opposite direction. While both are flying in the air, and removing the one from the other, each proceeding at the rate of six thousand fathoms in a minute, the Earth, during that same minute, is outflying the first, and removing from the second, with a velocity which carries it along at the rate of sixteen thousand fathoms; this ought to put the point of departure twenty-two thousand fathoms behind the ball which is flying to the West, and ten thousand fathom before that which is flying to the East.

I once proposed this difficulty to a very able Astronomer, who considered it as almost an insult. He replied, as the custom of our Doctors is, that the objection had been made long before and refuted. At length, as I entreated him to have compassion on my ignorance, and to give me the solution, he retailed to

me the pretended experiment, of a ball dropped from the top of a ship's mast, when under sail, and which falls on deck close to the mast, notwithstanding the ship's progressive motion. "The Earth," said he, "carries along, in like manner, the rotation of the "two balls, in it's own movement. Were they to be "shot off in a perpendicular direction, they would "fall back precisely on the point from whence they "were emitted." As axioms are not very expensive, and serve to cut short all difficulties, he subjoined this as one: "The motion of a great body absorbs "that of a small." If this axiom be founded in truth, replied I, the ball dropped from the top of the mast of a ship under sail, ought not to fall back close to the bottom of the mast; its motion ought to be absorbed, not of that of the vessel, but by that of the Earth, which is by far the greater body. It ought to obey only the direction of gravity; and for the same reason the Earth ought to absorb the motion of the bullet which is going along with it toward the East, and force it back into the cannon from which it issued.

I was unwilling to push this difficulty any farther: but I remained, as has frequently happened to me after the most luminous solutions of our schools, still more *perplexed* than I was before. I began to call in question the truth of not only a system and of an experiment, but that is worse, of an axiom. Not that I reject our planetary system, such as it is given us; but I admit it for the same reason which at first suggested it. It is from it's being the best adapted to the weakness of my body, and of my mind. I find,

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in fact, that the rotation of the Earth, every day, saves the Sun a prodigious journey: but, in other respects, I by no means believe that this system is that of Nature, and that she has disclosed the causes of motion to men, who are incapable of accounting for the movement of their own fingers.

I beg leave to suggest some farther probabilities in favour of the Sun's motion round the Earth. "The "Astronomers of Greenwich, having discovered that "a star of Taurus has a declination of two minutes "every twenty-four hours; that this star not being "dim, and having no train, cannot be considered as "a comet, communicated their observations to the "Astronomers of Paris, who found them accurate. "M. *Messier* was appointed to make a report of this "to the Academy of Sciences, at their next meet-"ing."*

If the Stars are Suns, here then is a Sun in motion, and that motion is a presumption, at least, that ours may move.

The stability of the Earth may be presumed, on the other hand, from this circumstance, that the distance of the Stars never changes with respect to us, which must perceptibly take place, if we performed every year, as is alleged, a round of sixty-four millions of leagues in diameter through the Heavens; for in a space so vast, we must of necessity draw nigher to some and remove from others.

Sixty-four millions of leagues, we are told, dwindle to a point in the Heavens, compared to the distance

* Extract from the Courier de l'Europe, Friday, 4th May, 1781.

of the Stars. I am much in doubt as to the truth of this. The Sun, which is a million of times greater than the Earth, presents an apparent diameter of only six inches, at the distance of thirty-two millions of leagues from us. If this distance reduces to a diameter so small, a body so immense, it is impossible to doubt, that double the distance, namely sixty-four millions of leagues, would diminish it still much more, and reduce it perhaps to the apparent magnitude of a Star; and it is far from being impossible, that on being thus diminished, and on our still removing sixty-four millions of leagues farther, he would entirely disappear. How comes it to pass, then, that when the Earth approaches, or removes to this distance from the Stars, in the firmament, in performing it's annual circle, no one of those Stars increases or diminishes in magnitude with respect to us.

I submit some farther observations tending to prove that the Stars have, at least, motions peculiar to themselves. The ancient Astronomers have observed in the neck of the Whale, a Star which presented much variety in it's appearances; sometimes it appeared for three months together, sometimes during a longer interval; sometimes it's apparent magnitude was greater, sometimes smaller. The time of it's appearance was irregular. The same Astronomers report, that they had observed a new Star in the heart of the Swan, which from time to time disappeared. In the year 1600 it was equal to a Star of the first magnitude; it gradually diminished, and at length disappeared. M. *Cassini* perceived

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it in 1655. It increased for five years successively; it then began to decrease, and re-appeared no more. In 1760 a new Star was observed near the head of the Swan. Father *Anselm*, a Carthusian friar, and several other Astronomers, made the observation. It disappeared, and became again visible in 1672. From that period it was seen no more till 1709, and in 1713 it totally disappeared.

These examples demonstrate that the Stars not only have motions, but that they describe curves very different from the circles and the ellipses which we have assigned to the heavenly bodies. I am fully persuaded, that there is among these the same variety of motion, as between those of many terrestrial bodies; and that there are stars which describe cycloïds, spirals, and many other curves of which we have not so much as an idea.

I must proceed no farther on this ground, for fear of appearing better informed respecting the affairs of Heaven, than those which are much nearer us. All that I intended was to expose my doubts and my ignorance. If stars are suns, then there must be Stars in motion; and, surely, ours may be in motion as well as they are.*

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* I now leave the Reader to reflect on the total disappearance of those Stars. The Ancients had observed seven Stars in the Pleiades. Six only are now perceptible. The seventh disappeared at the siege of Troy. *Ovid* says, it was so affected by the fate of that unfortunate city, as from grief to cover it's face with it's hand. I find in the book of *Job* a curious passage, which seems to presage this disappearance: it is chap. xxxviii. ver. 31. *Numquid conjungere valebis micantes stellas pleïades, aut gyrum arcturi pote-*

It is thus that our general maxims become the sources of error; for we never fail to charge with disorder whatever seems to recede from our pretended order. That which I formerly quoted, namely, that Nature, in her operations, takes always the shortest road, has filled our Physics with false views innumerable. There is nothing however more flatly contradicted by experience. Nature makes the waters of the rivers to meander through the Land, in their progress to the Sea, instead of transmitting them in a straight line. She causes the veins to perform a winding course through the human body; nay, she has perforated certain bones expressly, in order to afford a passage to some of the principal veins into the interior of the stronger limbs, to prevent their being exposed to injury by external concussions. In a word, she expands a mushroom in one night, but takes a century to bring an oak to perfection. Nature very seldom takes the nearest road, but she always takes that which is the best adapted to her purpose.

This rage for generalizing has dictated to us, in every branch of Science, an infinite number of maxims, Sentences, adages, which are incessantly

ris dissipare? "Will it be in thy power to unite the brilliant Stars, "the Pleiades; and to turn aside the Great Bear from it's course?" This is the import of the translation of M. *le Maître de Sacy*. However, if I might venture to give an opinion after that learned man, I would put a different sense on the conclusion of the passage. *Gyrum arcturi dissipare*, means, in my opinion, "to dissi- "pate the attraction of the arctic pole." I here repeat what I have already observed, that the Book of *Job* is replenished with most profound knowledge of Nature.

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contradicting themselves. It is one of our maxims that a man of genius catches every thing at a glance, and executes all by one single Law. For my own part, I consider this sublime method of observing and executing, as one of the strongest proofs of the weakness of the human mind. Man never can proceed with confidence but in one single path. As soon as a variety present themselves, he becomes perplexed and goes astray; he is at a loss to ascertain which he ought to pursue: that he may make sure of not deviating he admits only one to be right; and once engaged, right or wrong, pride stimulates him forward. The AUTHOR of Nature on the contrary, embracing in his infinite intelligence all the spheres of all beings, proceeds to their production by Laws as various as his own inexhaustible conceptions, in order to the attainment of one single end, which is their general good. Whatever contempt Philosophers may express for final causes, they are the only causes which he permits us to know. All the rest He is pleased to conceal from us; and it is well worthy of being remarked, that the only end which He discloses to our understanding is also the same with that which he proposes to our virtue.

One of our most ordinary methods, when we catch some effect in Nature is to dwell upon it, at first, from weakness, and afterwards, to deduce from it an universal principle, out of vanity. If after this we can find means, and it is no difficult matter to apply to it a geometrical theorem, a triangle, an equation, were it but an $a+b$, this is sufficient to render it for ever venerable. It was thus that, in the last age,

every thing was explained on the principles of the corpuscular philosophy, because it was perceived that some bodies were formed by intus-susception, or an aggregation of parts. A seasoning of Algebra, which they found means to add to it, has invested it with so much the more dignity, that most of the reasoners of those times understood nothing of the matter. But being indifferently endowed, it's reign was of short duration. At this day, we do not so much as mentioned the names of a long list of learned and illustrious gentlemen, whom all Europe then concurred in covering with laurels.

Others having found out that air pressed, set to work with every species of machinery to demonstrate that air possessed gravity. Our books referred every thing to the gravity of the air; vegetation, the human temperament, digestion, the circulation of the blood, the phenomena, the ascension, of fluids. They found themselves somewhat embarrassed, it is true, by capillary tubes, in which the fluid ascends, independently of the action of the air. But a solution was found for this likewise; and *wo betide* those, in the phrase of certain Writers, who do not comprehend it. Others applied themselves to the investigation of it's elasticity, and have explained equally well all the operations of Nature by this quality of the air. The universal cry was, now the veil is removed; we have caught her in the fact. But did not the Savage know, when he walked against the wind that air had both gravity and elasticity? Did he not employ both those qualities in managing his canoe when under sail? I do not object to investigation, if natural effects

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are applied, after exact calculation and unequivocal experiment, to the necessitiesof human life; but they are for the most part introduced for the purpose of regulating the operations of Nature, and not our own.

Others find it still more commodious to explain the system of the Universe, without deducing any consequence from it. They ascribe to it laws which have so much accuracy and precision, that they leave to the Divine Providence nothing more to do. They represent the Supreme Being as a Geometrician, or a Mechanist, who amuses himself with making spheres merely for the pleasure of setting them a-spinning round. They pay no regard to harmonies and other moral causes. Though the exactness of their observations may do them honour, the results are by no means satisfactory. Their manner of reasoning on Nature resembles that of a Savage, who on observing in one of our cities the motion of the indexes of a public clock, and seeing that on their pointing in a certain direction upon the hour-plate, the turrets fell a shaking, crowds issued into the streets, and a considerable part of the inhabitants were put in motion, should thence conclude that a clock was the principle of all European occupations. This is the defect to be imputed to most of the Sciences, which without consulting the end of the operations of Nature, perplex themselves in an unprofitable investigation of the means. The Astronomer considers only the course of the Stars, without paying the slightest attention to the relations which they have with the seasons. Chemistry, having discovered in the aggregation

gation of bodies only saline particles which mutually assimilate, sees nothing but salt as the principle and the object. Algebra having been invented in order to facilitate calculation, has degenerated into a Science which calculates only imaginary magnitudes, and which proposes to itself theorems only, totally inapplicable to the demands of human life.

From all this results an infinity of disorders, far beyond what I am able to express. The view of Nature, which suggests to Nations the most savage, not only the idea of GOD, but that of an infinity of Gods, presents to the Philosophers of the day only the idea of furnaces, of spheres, of stills, and of crystallizations.

The Naïads, the Sylvans, Apollo, Neptune, Jupiter, impressed upon the Ancients some respect at least for the Works of Creation, and attached them still farther to their Country by a sentiment of religion. But our machinery destroys the harmonies of Nature and of Society. The first is to us nothing but a gloomy theatre, composed of levers, pulleys, weights, and springs; and the second merely a school for disputation. Those systems we are told give exercise to the mental faculties. It may be so; but may they not likewise mislead the understanding? And the heart is in no less danger of being depraved. While the head is laying down principles, the heart is frequently deducing consequences. If every thing is the production of unintelligent powers, of attractions, of fermentations, the play of fibres, of masses, we then are subjected to their laws, as all other bodies are. Women and children deduce these consequences.

quences. What in the mean time becomes of Virtue? You must submit, say these ingenious gentlemen, to the Laws of Nature. So then we must obey the power of gravity; sit down and walk no more. Nature speaks to us by a hundred thousand voices. Which of these is now sounding in our ears? What, will you adopt as the rule of your life the example of fishes, of quadrupeds, of plants, or even of the heavenly bodies?

There are Metaphysicians, on the contrary, who without paying regard to any one Law of Physics, explain to you the whole system of the Universe by means of abstract ideas. But this is a proof that their system is not the system of Nature, namely, that with their materials and their method, it would be an easy matter to subvert their order, and to frame another totally different from it, provided one were disposed to take the small trouble which it requires. Nay a reflection arises out of this, which levels a mortal blow at the pride of human understanding; it is this, that all these efforts of the genius of Man, so far from being able to construct a World, are incapable of so much as putting a grain of sand in motion.

There are others who consider the state in which we live as a state of progressive ruin and of punishment. They proceed on the supposition, conformably to the authority of the Sacred Writings, that this Earth once existed with other harmonies. I readily admit what Scripture says on this subject, but I object to the explanations of Commentators. Such is the weakness of our intellectual powers, that we are incapable of conceiving or imagining any thing beyond

yond what Nature actually exhibits to us. They are grossly mistaken accordingly when they affirm, for instance, that when the Earth was in a state of perfection, the Sun was constantly in the Equator; that the days and nights were perpetually equal; that there was an eternal Spring; that the whole face of the ground was smooth and level, and so on.

Were the Sun constantly in the Equator, I question whether a single spot of the Globe would be habitable. First, the Torrid Zone would be burnt up by his fervent heat, as has been already demonstrated; the two Icy Zones would extend much farther than they do at present; the temperate Zones would be at least as cold toward their middle as they are with us at the vernal Equinox; and this temperature would prevent the greatest part of fruits from coming to maturity. I know not where the perpetual Spring would be: but if it could any where exist, never could Autumn there exist likewise. The case would be still worse were there neither rocks nor mountains on the surface of the Globe, for not one river, nay not a brook of water would flow over the whole Earth. There would be neither shelter nor reflex to the North, to cherish the germination of plants, and there would be neither shade nor moisture to the South to preserve them from the heat. These wonderful arrangements actually exist in Finland, in Sweden, at Spitzberghen, and over the whole northern regions, which become loaded with rocks in proportion as the latitude increases: and they rise in like manner in the Antilles, in the Isle of France, and in all other islands and districts comprehended between

between the Tropics, where the face of the ground is covered over with rocks, especially toward the Line; in Ethiopia, the territory of which Nature has overspread with vast and lofty rocks, almost perpendicular, which form all around them deep valleys, delightfully shady and cool. Thus, as was before observed, in order to refute our pretended plans of perfection, it is sufficient to admit them.

There is another class of Literati, on the contrary, who never deviate from their track, and who abstain from looking at any thing beyond it, however rich in facts they may be: such are the Botanists. They have observed the sexual parts in plants, and employ themselves entirely in collecting and arranging them, conformably to the number of those parts, without troubling themselves about knowing any thing farther of them. When they have classed them in their heads and in their herbals, into umbellated, into rose-formed, or into tubulous, with the number of their stamina; if to this they are able to affix a parcel of Greek terms, they are possessed, as they imagine, of the complete system of vegetation.

Others of them, to do them justice, go somewhat farther. They study the principles of plants; and in order to attain their object, pound them in mortars, or dissolve them in their alembics. The process being completed, they exhibit salts, oils, earths; and tell you gravely these are the principles of such and such a plant. For my own part, I no more believe that any one can shew me the principles of a plant in a phial, than he can display those of a wolf, or of a sheep in a kettle. I respect the mysterious operations

tions of Chemistry; but whenever they act on vegetables, the process destroys them. Permit me to quote the decision which an eminent Physician has pronounced on his own experiments. I mean Dr. *J. B. Chomel*, in the preliminary discourse to his useful Abridgement of the History of Common Plants.* "Two thousand analyses nearly," says he, "of different plants, made by the Chemists of the Royal "Academy of Sciences, have afforded us no farther "information than this, that from all vegetables may "be extracted a certain quantity of an acid liquor, "more or less of essential or fetid oil, of salt fixed, "volatile, or concrete, of insipid phlegm, and of "earth; and in many cases almost the same prin-"ciples, and in the same quantities, from plants "whose virtues are extremely different. This very "tedious and very painful pursuit, accordingly, has "turned out a merely useless attempt toward a dis-"covery of the effects of plants; and has served "only to undeceive us respecting the prejudices "which might have been entertained in favour of "such an analysis." He adds, that the celebrated Chemist *Homberg*, having sown the seeds of the same plants in two frames filled with earth, impregnated with a strong lye, the one of which was afterwards watered with common water, and the other with water in which nitre had been dissolved, these plants re-produced very nearly the same principles. Here then is our systematic Science completely overturned; for it can discover the essential qualities of plants neither by their composition nor their decomposition.

* Vol i. page 37.

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Many other errors have been adopted respecting the Laws of the expansion and the fecundation of plants. The Ancients had distinguished in many plants males and females; and a fecundation, by means of emanations of the seminal powder, such as in the date-bearing palm-tree. We have applied this Law to the whole vegetable kingdom. It embraces no doubt a very extensive field; but how many vegetables besides propagate themselves by suckers, by slips, by knittings by the extremities of their branches! Here are then, in the same kingdom, various methods of re-production. Nevertheless, when we perceive no longer in Nature the Law which has once been adopted in our books of Science, we are weak enough to imagine that she has gone astray. We have only one thread, and when it snaps we conclude that the system of the Universe must be on the point of dissolution. The Supreme Intelligence disappears from before our eyes the moment that our own happens to be a little disturbed. I entertain no doubt however, that the AUTHOR of Nature has established Laws for the vegetable World, now so generally studied, which are still to us entirely unknown. I take the liberty to subjoin on this subject an observation which I submit to the experience of my Readers.

Having transplanted, in the month of February of the year 1783, some simple violet plants, which had begun to push out small flower-buds; this transplantation checked their expansion in a manner very extraordinary. These small buds never came into flower, but their ovary having swelled, attained the usual size, and changed into a capsula filled with seeds, without

without displaying, outwardly or inwardly, either petal, or anthera, or stigma, or any part whatever of the flower. All these buds presented successively the same phenomena in the Months of May, of June, and of July, but no one of those violet plants presented the least semblance of a flower. I only perceived in the shooting buds which I opened, the parts which should have composed the flower withered within the calix. I sowed again their seeds which had not been fecundated, and hitherto they have not sprung up. This experiment so far is favourable to the Linnæan system; but it is in another respect a deviation, as it demonstrates the possibility of a plant's producing fruit without having flowered.

It may be here proper to remark, once for all, that physical Laws are subordinate to the Laws of utility, that is, to give an instance, the Laws of vegetation are adapted to the preservation of sensible beings, for whose use they were designed. Accordingly, though the flowering of my violet may have been interrupted, this prevented not the production of it's seeds, which were destined to be the subsistance of some animal, whose natural food it is. For this reason too the most useful plants, such as the gramineous, are those which have the greatest variety of methods to re-produce themselves. If Nature, with respect to them, had confined herself rigidly to the law of florification, they could not multiply; when pastured upon by animals which continually browze on their summits. The same thing takes place with regard to such as grow along the water course, as reeds and the aquatic trees; willows, alders, osiers, mangliers, when

when the waters swell, and bury them in sand, or totally subvert them, as is frequently the case. The shores would remain destitute of verdure, if the vegetables which are native there had not the faculty of re-production by means of their own shoots. But the case is different with respect to the vegetable inhabitants of the mountains, as palm-trees, firs, cedars, larches, pines, which are not exposed to similar accidents, and which cannot be propagated by slips. Nay, if you crop off the summit of the palm tree, it dies.

We likewise find these same laws of adaptation and utility in the generation of animals, to which we ascribe uncertainty, as soon as we perceive variety: or when we apprehend an approximation to the vegetable kingdom by means of imaginary relations, suggested by the perception of effects common to both. Thus, for example, if some of our more delicate plant-insects are viviparous in Summer, it is because their young find at that season the temperature and the food which are adapted to them on coming into the world; and if they are oviparous in Autumn, it is because the posterity of creatures so delicate could not have survived the Winter, without having been shut up in eggs. For similar reasons, if you tear off a claw from a live crab or lobster, it pushes out another, which springs out of it's body, as a branch out of a tree. Not that this animal's re-production is the effect of any mechanical analogy between the two kingdoms: but those animals being destined to live on the shores, among the rocks, where they are exposed to the agitation of the waves, Nature has

bestowed on them the faculty of reproducing the limbs exposed to be bruised, or broken off, by the rolling about of rocky substances, as she has given to vegetables which grow by the waters the power of re-production by shoots, because they are exposed to the danger of being overwhelmed by inundations.

Medicine has deduced a multitude of errors from those apparent analogies of the vegetable and animal kingdoms. It is sufficient to examine the train of her studies, to be satisfied that they are liable to strong suspicions. She pursues the operations of the soul through the structure of a corpse, and the functions of life in the lethargy of death. If she happens to perceive some valuable property in a vegetable, she exalts it into an universal remedy. Listen to her aphorism. Plants are useful to human life: hence she concludes, that a vegetable diet will make a man live for several ages. Who is able to enumerate the books, the treatises, the panegyrics, which have been composed on the virtues of plants! Multitudes of patients die, notwithstanding, with their stomachs full of those wonderful simples. Not that I undervalue their qualities when judiciously applied; but I absolutely reject the reasonings which attempt to connect the duration of human life with the use of a vegetable regimen.

The life of Man is the result of all the moral adaptations, and depends much more on sobriety, on temperance, and the other virtues, than on the nature of aliments. The animals which live entirely on plants, do they even attain so much as the age of Man? The deer and wild goats which feed on the admirable vulnerary

vulnerary herbs of Switzerland ought never to die; nevertheless they are very short-lived. The bees which suck the nectar of their flowers likewise die, and several of their species, in the space of one year. There is a limited term fixed for the life of every kind of animal, and a regimen peculiar to it; that of Man alone extends to every variety of aliment. The Tartar lives on raw horse flesh, the Dutchman on fish, another nation on roots, another on milk diet; and in all countries you meet with old people. Vice alone, and mental uneasiness, shorten human life; and I am persuaded, that the moral affections are of such extensive influence, with respect to Man, that there is not one in the whole catalogue of diseases but what owes it's origin to them.

Hear what *Socrates* thought of the systematic Philosophy of his age; for in all ages she has abandoned herself to the same extravagancies. "He did not "amuse himself," say *Xenophon*,* "with researches "into the mysteries of Nature; or with enquiring "in what manner that which the Sophists call the "World was created; nor what irresistible elastic "force governs all celestial things: on the contrary, "he exposed the folly of those who addict themselves "to such contemplations, and demanded, if it was "after having acquired a perfect knowledge of hu-"man things that they undertook the investigation "of those which are divine; or whether they con-"sidered it as a character of true wisdom, to neglect "what was within their reach, in order to grasp at "objects far above them. He expressed still farther

* *Xenophon*'s Memorable Things of *Socrates*, book i.

" astonishment, that they did not discern the impos-
" sibility of Man's comprehending all those wonders,
" considering that the persons who had the reputa-
" tion of being most profoundly skilled in such mat-
" ters, maintained opinions contradictory to each
" other, and quarrelled like madmen. For as among
" madmen there are some undaunted at the approach
" of the most formidable calamities, and others af-
" frighted where there is no appearance of danger ;
" in like manner, among those Philosophers some
" have maintained, that there is no action which may
" not be performed in public, nor a word which may
" not be freely spoken in the presence of the whole
" World ; others on the contrary have taught, that
" all intercourse with men ought to be broken off,
" and perpetual solitude preferred to society ; some
" have poured contempt on temples and altars, and
" derided the worship of the Gods ; others are such
" slaves to superstition, as to adore wood, and stone,
" and irrational animals. And as to the Science of
" natural things, some have acknowledged but one
" single being; others have admitted an infinite
" number: some insist, that all things are in a state
" of perpetual motion ; others, that there is no such
" thing as motion ; some tell you that the world
" is filled with incessant generations and dissolu-
" tions ; and others assure you that nothing is ge-
" nerated or destroyed. He said farther, that he
" would gladly be informed by those ingenious gen-
" tlemen, whether they entertained the hope of some
" time or other reducing to practice what they taught,
" as persons instructed in any art have it in their
" power

" power to exercise it at pleasure, either for their " own private emolument, or for the benefit of their " friends; and whether they likewise imagined, after " they had discovered the causes of every thing that " comes to pass, that they should be able to dispense " winds and rains, and dispose of times and seasons, " in subserviency to their necessities; or if they satis- " fied themselves with the bare knowledge of those " things, without any expectation of advantage from " them."

Not that *Socrates* was unacquainted with Nature, for he had studied her thoroughly; but he had relinquished the investigation of the causes, entirely in the view of rising into admiration at the results. No one had ever collected more observations on this subject than he had done. He made frequent use of these in his conversations on the Divine Providence.

Nature presents to us, on every side, nothing but harmonies and adaptations to our necessities; and we will obstinately persist in vain efforts to trace her up to the causes which she employs; as if we meant to extort from her the secrets of her power. We do not so much as know the most common principles which she sets a working in our hands and in our feet. Earth, water, air, and fire, are elements, as we say. But under what form must Earth appear in order to be an element? That stratum called *humus*, which almost every where covers it, and which serves as a basis to the vegetable kingdom, is a refuse of all sorts of substances, of marl, of sand, of clay, of vegetables.

Is it the sand which constitutes it's elementary

part? But sand appears to be a secretion from the rock. Is it the rock then which is an element? But it has the appearance, in it's turn, of being an aggregation of sand, as we see it to be in masses of freestone. Whether of the two, sand or rock, was the principle of the other? and which took the precedency in the formation of the Globe? Supposing us possessed of authentic information as to this particular, what ground have we gained? There are rocks formed of aggregations of all sorts. Granite is composed of grains; marbles and calcareous stones, of the paste of shells and madrépores. There are banks of sand, composed of the wrecks of all these stones: I have seen the sand of crystal.

Shell-fish, which seem to give us some light respecting the nature of calcareous stone, by no means indicate to us the primitive origin of that substance; for they themselves form the refuse that swims in the Seas. The difficulties increase as you attempt to explain the formation of so many various bodies issuing out of the Earth, and nourished by it. In vain you call to your assistance analogies, assimilations, homogeneities, and heterogeneities. Is it not strange that thousands of species of resinous, oily, elastic, soft, and combustible vegetables, should differ so entirely from the rugged and stony soil which produces them?

The Siamese Philosophers easily get rid of all embarrassments on the subject, for they admit in Nature a fifth element, which is wood. But this supplement is incapable of carry them very far; for it is still more astonishing, that animal substance should be formed of vegetable, than that this last should be formed

formed of fossil. Which way does it become sensible, living and impassioned? They admit, I grant, the interposition of the Sun's action. But how is it possible that the Sun should be, in animals, the cause of any moral affection; or, if you like the phrase better, of any passion, when we do not see it exercising a disposing influence even on the component parts of plants? For example, its general effect is to dry that which is humid. How comes it to pass then, that in a peach exposed to its action, the pulp externally should be meltingly plump, and the nut within extremely hard; whereas the contrary takes place in the fruit of the cocoa-tree, which is replenished with milk inwardly, and clothed externally with a shell as hard as a stone?

Neither has the Sun more influence on the mechanical construction of animals: their interior parts, which are most constantly moistened with humours, with blood and marrow, are frequently the hardest, such as the teeth and the bones; and the parts most exposed to the action of his heat are often very soft, as hair, feathers, the flesh and the eyes. Once more, how comes it to pass, that there is so little analogy between plants tender, ligneous, liable to putrefaction, and the Earth which produces them; and between the corals and the mâdrépores of stone, which form banks so extensive between the Tropics, and the sea-water in which they are formed? To all appearance, the contrary ought to happen: the water ought to have produced soft plants, and the earth solid plants If things exist thus, there must undoubtedly be more

than one good reason for it; I think I have a glimpse of a very tolerable one: it is this, that if these analogies actually took place, the two elements would in a short time become uninhabitable; they would soon be overwhelmed by their own vegetation. The Sea would be incapable of breaking madrépores of wood, and the air of dissolving forests of stone.

The same doubts might be started respecting the nature of Water: This element, we allege, is formed of small globules which roll over one another; that it is to the spherical form of it's elementary particles we ought to ascribe it's fluidity. But if these are globules, there must be between them intervals and vacuities, without which they could not be susceptible of motion. How comes it to pass then that water is incompressible? If you apply to it a strong compressing power in a tube, it will force it's way through the pores of that tube, though it be of gold; and will burst it, if of iron. Employ what efforts you please, you will find it impossible to reduce it to a smaller size. But so far from knowing the form of it's component parts, we cannot so much as determine that of the combined whole. Does it consist in being expanded into invisible vapours in the air, as the dew, or collected into mists in the clouds, or consolidated into masses in the ice, or finally in a fluid state, as in the rivers Fluidity, it is said, forms one of it's principal characters. Yes, because we drink it in that state, and because under this relation it interests us the most. We determine it's principal character, as we do that of all the objects of Nature, for the

the reason which I have already suggested, from our own most craving necessity; but this very character appears foreign to it: for it owes it's fluidity only to the action of the heat; if you deprive it of this it changes into ice. It would be very singular should it be made to appear, after all our fundamental definitions, that the natural state of water was to be solid and that the natural state of earth was to be fluid: now this must actually be the case, if water owes it's fluidity only to heat, and if earth is nothing but an aggregation of sands united by different glues, and attracted to a common centre by the general action of gravity.

The elementary qualities of air are not of more easy determination. Air we say, is an elastic body: when it is shut up in the grains of gun-powder, the action of fire dilates it to such a degree, as to communicate to it the power of hurling a globe of iron to a prodigious distance. But how could it have been, with all this elasticity, compressed into the grains of a crumbling powder? If you put even any liquid substance into a state of fermentation in a flask, a thousand times more air will be separated from it than you could force into the vessel without breaking it. How could this air be confined in a substance soft and fluid, without disengaging itself by it's own action?

The air when loaded with vapours, we farther say, is refrangible. The farther we advance to the North, the more elevated does the Sun appear over the Horizon, above the place which he actually occupies in the Heavens. The Dutch mariners, who passed the Winter

ter of 1597, in Nova-Zembla, after a night of several months, saw the Sun re-appear fifteen days sooner than they expected his return. All this is very well. But if vapours render the air refrangible, why is there no Aurora nor twilight, nor any durable refraction of light whatever between the Tropics, not even on the Sea, where so many vapours are exhaled by the constant action of the Sun, that the Horizon is sometimes quite involved in mist by them?

The light is not refracted, says another Philosopher, by the vapours, but by the cold; for the refraction of the Atmosphere is not so great at the end of Summer, as at the end of Winter, at the autumnal Equinox, as at the vernal.

I admit the truth of this observation; however, after very hot days in Summer there is refraction to the North, as well as in our temperate climates, and there is none between the Tropics: the cold therefore does not appear to me to be the mechanical cause of refraction, but it is the final cause of it. This wonderful multiplication of light, which increases in the Atmosphere, in proportion to the intenseness of the cold, is in my apprehension a consequence of the same Law which transmits the Moon into the northern signs, in proportion as the Sun forsakes them, and which causes her to illuminate the long nights of our Pole, while the Sun is under the Horizon; for light, be of what sort it may, is warm. These wonderful harmonies are not in the nature of the Elements, but in the will of HIM who has established them in subordination to the necessities of a being endowed with sensibility.

Fire

Fire presents to us phenomena still more incomprehensible. First of all, Is fire matter? Matter according to the definitions of Philosophy, is that which is divisible in length, breadth, and depth. Fire is divisible only in perpendicular length. Never will you divide a flame, or a ray of the Sun, in it's horizontal breadth. Here then is matter divisible only into two dimensions. Besides, it has no gravity, for it continually ascends; nor levity for it descends, and penetrates bodies ever so much below it. Fire, we are told, is contained in all bodies. But, being of a consuming nature, How does it not devour them? How can it remain in water without being extinguished?

These difficulties, and several others, induced *Newton* to believe that fire was not an element, but certain subtile matter put in motion. Friction it is true, and collision, elicit fire from several bodies. But how comes it that air and water, though agitated ever so much, never catch fire? Nay, How comes it that water even gets cold by motion though it's fluidity is entirely owing to it's being impregnated by fire? Contrary to the nature of all other motions, Wherefore does that of fire go in a constant state of propagation, instead of meeting a check? All bodies lose their motion by communicating it. If you strike several billiard balls with one, the motion is communicated among them, it is divided and lost. But a single spark of fire disengages from a piece of wood the igneous particles, or the subtle matter if you will, which are contained in it, and the whole together increase their rapidity to such a degree,

gree, as to make one vast conflagration of a whole forest.

We are not better acquainted with the negative qualities. Cold they tell us is produced by the absence of heat; but if cold is merely a negative quality, How is it capable of producing positive effects? If you put into water a bottle of iced wine, as I have seen done in Russia oftener than once, you perceive in a short time ice of an inch in thickness cover the outside of the bottle. A block of ice diffuses cold all over the surrounding atmosphere. Darkness nevertheless, which is a privation of light, diffuses no obscurity over surrounding light. If you open in a day of Summer a grotto at once dark and cool, the surrounding light will not be in the least impaired by the darkness which it contained; but the heat of the adjacent air will be perceptibly diminished by the cold air which issues from it. I am aware of the reply; it will be said, if there is no perceptible obscuration in the first case, it is owing to the extreme rapidity of light which replaces the darkness; but this would be increasing the difficulty instead of removing it, by supposing that darkness too has positive effects, which we have not time now to animadvert upon.

It is however on such pretended fundamental principles that most of our systems of Physics are reared. If we are in an error, or in a state of ignorance at the point of departure, it cannot be long before we go astray on the road; and it is really incredible with what facility, after having laid down our principles so slightly, we repay ourselves in consequences, in vague terms, and in contradictory ideas.

I have

I have seen for example, the formation of thunder explained in highly celebrated physical tracts. Some demonstrate to you that it is produced by the collision of two clouds, as if clouds or foggy vapours ever could produce a collision! Others gravely tell you, that it is the effect of the air dilated by the sudden inflammation of the sulphur and of the nitre which float in it. But, in order to it's being capable of producing those tremendous explosions, we are under the necessity of supposing that the air was confined in a body which made some resistance. If you set fire to a great mass of gun powder in an unconfined situation, no explosion follows. I know very well that the detonation of thunder has been imitated in the experiment of fulminating powder; but the materials employed in the composition of it have a sort of tenacity. They undergo, on the part of the iron ladle which contains them, a resistance against which they sometimes act with such violence as to perforate it. After all, to imitate a phenomenon is not to explain it. The other effects of thunder are explained with similar levity. As the air is found to be cooler after a thunder-storm, the nitre we are told which is diffused through the Atmosphere, is the cause of it; but was not that nitre there before the explosion, when we were almost suffocated with heat? Does nitre cool only when it is set on fire? According to this mode of reckoning, our batteries of cannon ought to become glaciers in the midst of a battle, for a world of nitre is kindled into flame on such occasions; they are under the necessity however of cooling the cannon with vinegar; for, after having been

been fired off twenty times in quick succession, it is impossible to apply your hand to the piece. The flame of the nitre, though instantaneous, powerfully penetrates the metal, notwithstanding it's thickness and solidity.

The heat it is true may likewise be occasioned by the interior vibration of the parts. Whatever may be in this, the cooling of the air after a thunder-storm proceeds, in my opinion, from that stratum of frozen air which surrounds us, to the height of from twelve to fifteen hundred fathoms: and which being divided and dilated at it's base by the fire of the stormy clouds, flows hastily into our Atmosphere. It's motion determines the fire of the thunder to direct itself, contrary to it's nature, toward the Earth. It produces still farther effects, which neither time nor place permit me at present to unfold.

It was affirmed in the last age that the Earth was drawn out at the Poles; and we are now positively told that it is flattened there. I shall not at present enter into an examination of the principles from which this last conclusion has been deduced, and the observations on which it has been supported. The flattening of the Earth at the Poles has been accounted for from a centrifugal force, to which likewise it's motion through the Heavens has been ascribed; though this pretended force, which has increased the diameter of the Earth at the Equator, has not the power of raising so much as a straw into the air.

The flattening of the Poles they tell us has been ascertained by the measurement of two terrestrial degrees, made at a vast expense, the one in Peru, near the

the Equator, and the other in Lapland, bordering upon the Polar Circle.* Those experiments were made undoubtedly by men of very great capacity and reputation. But persons of at least equal capacity, and of a name equally as high in the republic of Science, had demonstrated upon other principles, and by other experiments, that the Earth was lengthened at the Poles. *Cassini* estimates at fifty leagues the length by which the axis of the Earth exceeds it's diameters, which gives to each of the Poles twenty-five leagues of elevation over the circumference of the Globe. We shall certainly enlist under the banner of this illustrious Astronomer, if we consider the testimony of the eye as of any weight; for the shade of the Earth appears oval over it's Poles, in central eclipses of the Moon, as was observed by *Ticho Brhaé* and *Kepler*. These names are a host in themselves.

But without considering any name as an authority, where natural truths are concerned, we may conclude, from simple analogies, the elongation of the axis of the Earth. If we consider, as has been already said, the two Hemispheres as two mountains, whose bases are at the Equator, the summits at the Poles and the Ocean, which alternately flows from one of these summits as a great river descending from a mountain, we shall have under this point of view, objects of comparison which may assist us in determining the point of elevation from which the Ocean takes it's rise, by the distance of the place where it's

* It is evident that the conclusion from these very measurements ought to have been, that the Earth is lengthened at the Poles. See the Explanation of the Plates.

course

course terminates. Thus the summit of Chimboraco, the most elevated of the Andes of Peru, out of which the river of the Amazons issues, having a league and one-third nearly of elevation above the mouth of that river, which is distant from it in a straight line, about twenty-six degrees, or six hundred and fifty leagues, it may be thence concluded that the summit of the Pole must be elevated above the circumference of the Earth nearly five leagues, in order to have a height proportioned to the course of the Ocean, which extends as far as the Line, ninety degrees distant, that is to say, two thousand two hundred and fifty leagues in a straight line.

If we farther consider that the course of the Ocean does not terminate at the Line, but that when it descends in Summer from our Pole, it extends beyond the Cape of Good-Hope, as far as to the eastern extremities of Asia, where it forms the current known by the name of the Westerly Monsoon, which almost encompasses the Globe under the Equator, we shall be under the necessity of assigning to the Pole, from which it takes it's departure, an elevation proportioned to the course which it is destined to perform, and of tripling at least that elevation, in order to give it's waters a sufficient declivity. I put it down then at fifteen leagues: and if to this height we add that of the ices which are there accumulated, the enormous pyramids of which over icy mountains have sometimes an elevation of one-third above the heights which support them, we shall find that the Pole can hardly have less than an elevation of the twenty-five leagues above the circumference which *Cassini* assigned to it.

Obelisk

Obelisks of ice ten leagues high, are not disproportioned to the centre of cupolas of ice two thousand leagues in diameter, which in Winter cover our northern Hemisphere; and which have likewise in the southern Hemisphere, in the month of February, that is, in the very Midsummer of that Hemisphere, prominent borders, elevated like promontories, and three thousand leagues at least in circumference, according to the relation of Captain *Cook*, who coasted round them in the years 1773 and 1775.

The analogy which I establish between the two Hemispheres of the Earth, the Poles, and the Ocean which flows from them, and two mountains, their peaks, and the rivers which there have their sources, is in the order of the harmonies of the Globe, which exhibits a great number of similar harmonies on a smaller scale in the Continents, and in most islands, which are Continents in miniature.

It would appear that Philosophy has, in all ages, affected to find out very obscure causes, in order to explain the most common effects, in the view of attracting the admiration of the vulgar, who in fact scarcely ever admire any thing but what they do not comprehend. She has not failed to take the advantage of this weakness of mankind, by infolding herself in a pomposity of words, or in the mysteries of Geometry, the better to carry on the deception. For how many ages did she ring in our schools, the horror of a *vacuum* which she ascribed to Nature? How many sagacious pretended demonstrations of this have been given, which were to crown their authors with

never-fading laurels, but which are now gone to the land of forgetfulness?

She disdains, on the other hand, to dwell on simple observations, which bring down to the level of every capacity the harmonies which unite all the kingdoms of Nature. For example, the Philosophy of our day refuses to the Moon all influence over vegetables and over animals. It is nevertheless certain, that the most considerable growth of plants takes place in the night-time; nay, that there are several vegetables which flower only during that season; that numerous classes of insects, birds, quadrupeds and fishes, regulate their loves, their hunting matches, and their peregrinations according to the different phases of the orb of night. But what, degrade Philosophers to the experience of gardeners and fishermen! What, condescend to think and talk like such groundlings!

If Philosophy denies the influence of the Moon over the minuter objects of the Earth, she makes it up amply by conferring on her a very extensive power over the Globe itself, without being over-scrupulous about the self-contradiction. She affirms that the Moon, in passing over the Ocean, presses upon it, and thus occasions the flux of the tides on it's shores. But how is it possible that the Moon should compress our Atmosphere, which only extends, they say, to a score of leagues at most from us? Or, admitting a subtile matter, and possessed of great elasticity, which should extend from our Seas as far as to the globe of the moon, how could this matter be compressed by it, unless you suppose it confined in a channel; Must it not, in it's actual state, extend to the right and to the left,

left, while the action of the planet found it impossible to make itself felt on any one determinate point of the circumference of our Globe?

Besides, why does not the Moon act on lakes and seas of small extent, where there are no tides? Their smallness ought no more to exempt them from the influence of her gravitation, than deprive them of the benefit of her light. Why are tides almost imperceptible in the Mediterranean? Wherefore do they undergo, in many places, intermittent movements, and retardations of two or three days? Wherefore, in a word, toward the North, do they come from the North, from the East, or from the West, and not from the South, as was observed with surprize by *Martens*, *Barens*, *Linschoten*, and *Ellis*, who expected to see them come from the Equator, as on the coasts of Europe?

The principal movements of the Sea, it must be allowed, take place in our Hemisphere, at the same times with the principal phases of the Moon; but we ought not from thence to conclude their necessary dependence, and still less explain it by laws which are not demonstrated. The Currents and the Tides of the Ocean proceed, as I think I have proved, from the effusion of the ices of the Poles; which depend in their turn on the variety of the course of the Sun, as he approaches less or more toward either Pole: and as the phases of the Moon are themselves regulated by the course of the Orb of Day, this is the reason why both take place at the same time.

Farther, the Moon when full has, as we have already observed, an effective and evaporating warmth:

she must act therefore on the polar ices, especially when at the full.* The Academy of Sciences formerly maintained that her light did not warm, after experiments made on her rays, and on the ball of a thermometer with a burning mirror. But this is not the first error into which we have been betrayed by our books and our machinery, as we shall see when we come to speak of the decomposition of the solar ray by the prism. Neither is it the first time that an assembly of Literati have, without examination, adopted an opinion on the authority of persons who made experiments with much formality and stateliness. And this is the way that errors get into vogue. The one in question has however been completely refuted, first at Rome, and afterwards at Paris, by a very simple experiment. Some one took a fancy to expose a vessel full of water to the light of the Moon, and to place one similar to it in the shade. The water in the first vessel was evaporated much sooner than that in the second.

To no purpose do we exert all our industry and ingenuity; we can lay hold of nothing in Nature, except results and harmonies: first principles universally escape us. And, what is worst of all, the methods of our Sciences have exercised a pernicious influence on our morals and on religion. It is very easy to mislead men with respect to an intelligence which governs all things, when nothing is presented

* This observation was made more than sixteen hundred years ago. "The Moon produces thaw; dissolving all ices and frosts "by the humidity of her influence." *Pliny's Natural History*, book ii. chap. 101.

to

to them as first causes but mechanical means. Alas! it is not by these that we shall be able to find our way toward that Heaven which we pretend to know so well. The greatest of Mankind have cast an eye thitherward as their last asylum. *Cicero* flattered himself with the hope of being, after death, an inhabitant of the Stars; and *Cesar*, from that elevation to preside over the destiny of Rome. An infinite number of other men have limited their future happiness to a superintendance of mausoleums, groves, fountains; and others to a re-union with the objects of their loves. As for us, what are we now hoping for from Earth and from Heaven, where we see nothing beyond the levers of our pitiful machines?

How! as the reward of our virtues, is our destination to mount no higher than this, to be confounded with the elements? What, thy soul, O sublime *Fenelon!* to be exhaled in inflammable air; and to have had on the Earth the sentiment of an order which did not exist even in the Heavens! How, among those Stars so luminous, is there nothing but material Globes; and in their motions, so constant and so varied, nothing but blind attractions? How! Every thing around us insensible matter and no more; and intelligence given to Man, who could give himself nothing, only to render him miserable! How! and can we have been deceived by the involuntary sentiment which makes us raise our eyes to Heaven, in the agony of sorrow, there to solicit relief! The animal on the point of closing his career, abandons himself to his natural instincts. The stag at bay seeks refuge in the most sequestered spot of the forests, content to

yield up the roving spirit which animates him, under their hospitable shades. The dying bee forsakes the flowers, returns to expire at the door of her hive, and to bequeath her social instinct to her beloved Republic. And Man, following the bent of his reasoning powers, can he no where find, in the widely extended Universe, any thing worthy of receiving his departing sighs; not even inconstant friends, nor selfish kindred, nor an ungrateful County, nor a soil stubborn to all his labours, nor a Heaven indifferent to crimes and to virtue?

Ah! it is not thus that Nature has apportioned her gifts. We bewilder ourselves with our vain Sciences. By driving the researches of our understanding up to the very principles of Nature, nay of DEITY, we have stifled in the heart all feelings of both the one and the other. The same thing has befallen us which once befel a peasant who was living happily in a little valley in the heart of the Alps. A brook which descended from these mountains fertilized his garden. For a long time he adored in tranquillity the beneficent Naïad who kept his stream perpetually flowing, and who increased it's quantity and it's coolness as the Summer's heat increased. One day a fancy struck him that he would go and discover the place where she concealed her inexhaustible urn. To prevent his going astray, he begins with pursuing upward the track of his rivulet. Every step he takes in ascending discovers to him a thousand new objects; plains, forests, rivers, kingdoms, boundless Oceans. Transported with delight, he proceeds in flattering hope of speedily reaching the blessed abode where the Gods

Gods preside over the destiny of this world. But ofter a painful scramble, he arrives at the bottom of a tremendous glacier. He no longer sees any thing around him but mists, rocks, torrents, precipices. All, all has vanished. Sweet and tranquil valley, humble roof, beneficent Naiad! his patrimony is now reduced to a cloud, and his divinity to an enormous mass of ice.

It is thus that Science has conducted us through seductive paths to a termination so fearful. She drags after her, in the train of her ambitious researches, that ancient malediction pronounced against the first man who should dare to eat the fruit of her forbidden tree.* "Behold, the man is become as one of us, "to know good and evil. He shall not therefore "put forth his hand, and take also the tree of life, "and eat and live for ever." What literary, political, and religious squabbles have our pretended Sciences excited! How many men has she prevented from living even a single day!

The sublime genius and the pure spirit of *Newton*, assuredly could not have stood still at the boundary prescribed to a vulgar mind. On observing the clouds resorting from every quarter to the mountains which separate Italy from the rest of Europe, he would have inferred the attraction of their summits, and the direction of their chains, conformably to the basons of the Seas, and to the courses of the winds: he would thence have inferred equivalent dispositions for the different summits of the Continent and of the Islands: he would have seen the vapours arising out of the

* Genesis, chap. iv. verse 22.

bosom of the Seas of America, and conveying through the air fecundity to the centre of Europe, fixing themselves in solid ice on the lofty pinnacles of the rocks, in order to cool the Atmosphere of hot countries; undergoing new combinations, to produce new effects; and returning in a fluid state to wash their former shores, diffusing, in their mysterious progress, unlimited abundance in a thousand different channels. He would have observed with admiration the constant impulsion communicated to so many various movements, by the action of one single luminary, the Sun, placed at the distance of thirty-two millions of leagues: and instead of fruitlessly rambling after the habitation of a Naïad at the summit of the Alps, he would have prostrated himself before that GOD whose providence embraces the concerns of a whole Universe.

In order to study Nature with understanding and to advantage, all the parts must be viewed in their harmony and connection. For my part, I who do not pretend to be a *Newton*, am determined never to leave the borders of my rivulet. I shall set up my rest in my humble valley, and employ myself in culling some herbs and flowers; happy if I am able to form of them some garlands to decorate the entrance of that rustic Temple, which my feeble hands have presumed to rear to the Majesty of Nature!*

* The system of the harmonies of Nature, which I am proceeding to unfold, is, in my opinion, the only one which is within the reach of Man. It was first displayed by *Pythagoras* of Samos, who was the father of Philosophy, and the founder of that sect of Philosophers who have been transmitted to us under the name of Pythagoreans.

thagoreans. Never did a succession of men arise so enlightened as those sages were in the natural Sciences; and none whose discoveries reflect higher honour on the human understanding. There existed at that time Philosophers who maintained that water, fire, air, atoms, were the principles of things. *Pythagoras* insisted, in opposition to this doctrine, that the principles of things were the adaptations and the proportions of which the harmonies were composed, and that goodness and intelligence constituted the nature of GOD.

He was the first who gave to the Universe the epithet of κόσμος, *mundus*, because of it's order. He maintained that it was governed by a Providence; a sentiment perfectly conformable to the tenor of our Sacred Books and to experience. He invented the five Zones, and the obliquity of the Zodiac. He taught that the Torrid Zone was habitable. He ascribed earthquakes to the water. In fact their focuses, as well as those of volcanos, as we have already indicated, are always in the vicinity of the Sea, or of some great lake. He believed that each of the Stars was a World, containing an Earth, an Air, and a Heaven; and even in his time, this had been an anciently received opinion; for it is to be found in the verses of *Orpheus*. Finally, he discovered the square of the hypothenuse, which has served as a basis to an infinite number of geometrical theorems and solutions.

Philolaüs, of Crotona, one of his disciples, maintained, that the Sun received the fire diffused over the Universe, and reverberated it, which affords a better explanation of his nature than the perpetual emanations of light and heat which we ascribe to him, without reparation and without exhaustion. He held that Comets were Stars which re-appeared after a certain revolution. *Æcetes*, another Pythagorean, maintained the existence of two Continents, that which we inhabit and one opposite to it; an idea applicable only to America.

These Philosophers believed that the soul of Man was a harmony composed of two parts; the one reasonable, the other irrational. They placed the first in the head, and the other round the heart. They contended for it's immortality; and taught, that at the death of the man his soul returned to the Soul of the Universe. They approved of divination by dreams and augury, and condemned that which is performed by means of sacrifices. They had

had such a strong sense of humanity that they abstained from shedding the blood even of animals, and from eating their flesh.

Nature rewarded their virtues, and the gentleness of their manners by innumerable discoveries, and bestowed on them the glory of having as followers, *Socrates*, *Plato*, *Archytas* of Tarentum, who invented the screw, *Xenophon*, *Epaminondas*, who was educated by *Lysis* the Pythagorean, and the good king *Numa*, who taught the Tuscan priests to conjure down the thunder: in a word, she conferred on them all the lustre that Philosophy, Literature, the Military Art, or Royalty itself can communicate to the most favoured of mortals.

Pythagoras has been calumniated as having given encouragement to certain unmeaning superstitions, among others, abstinence from the use of beans, &c. But as truth is frequently under the necessity of presenting herself to men under a veil, the great Philosopher, under this allegory, conveyed to his disciples an advice to abstain from public employments, because it was then the custom to make use of beans in voting at the election of Magistrates.

A very celebrated Writer of modern times, who seems to look with an evil eye on every man of illustrious reputation, has presumed to attack the character of *Xenophon*, in whom were united almost all the eminent qualities, which can dignify human nature; piety, purity of manners, military skill and valour, and eloquence. His style is so sweetly flowing, that the Greeks bestowed on him the appellation of the Athenian Bee. This great man has been lately censured on the ground of that celebrated retreat, by which he brought back ten thousand Greeks into their own Country from the very extremity of Persia, having performed a march of eleven hundred leagues through a hostile country, and amidst foes innumerable.

It has been asserted by a man of great learning, that the retreat of this renowned General was an effect of the good-nature or the piety of *Artaxerxes*; and he has of consequence treated the route which *Xenophon* pursued, by the north of Persia, as a superfluous precaution.—But is it credible that the King of Persia intentionally shewed indulgence to the Greeks, when we know, that by a perfidious piece of cruelty he had put to death twenty-five of their chief men? How was it possible for those Greeks to have returned

returned by the same road which they went, considering that every thing in this track had been put in motion to intercept them, and that the Persians had, through it's whole extent, destroyed the villages? *Xenophon* defeated all their precautions, by directing his march through a track of which they had no foresight.

For my own part, I consider this military expedition as the most illustrious that ever was atchieved: not only from the innumerable conflicts, crossing of rivers, forced marshes over mountains, in the face of myriads upon myriads of enemies, through which it was accomplished; but because it was not sullied by a single act of injustice, and had no other object in view but the preservation of citizens. All that is held in high renown among the Warriors of Antiquity, have considered the retreat of the ten thousand as a master-piece in the military art. There is a single expression transmitted to us, which will for ever cover it with glory, uttered in an age and among a people by which the Science of War was carried to the height of perfection, and in a situation which admitted not of dissimulation: I mean an expression of *Anthony*, when entangled in the country of the Parthians. That General, who possessed great military talents, and had at that time the command of an army of a hundred and thirteen thousand men, of whom sixty thousand were actually Roman citizens, obliged, as *Xenophon* was, to make a retreat in the face of the Parthians, and twenty times on the point of failing in his attempt, frequently exclaimed, with a sigh! *O the ten thousand!* (See *Plutarch.*)

STUDY TENTH.

Of some general Laws of Nature; and first, of Physical Laws.

WE shall divide these Laws into Laws *physical* and Laws *moral*. We shall first examine, in the sequel of this Volume, some physical Laws common to all the Kingdoms of Nature; and in the following Study, shall make the application of them to plants, in conformity to the Plan proposed in the commencement of this Work. We shall afterwards proceed to the consideration of *moral* Laws: and shall endeavour to unfold in these, as well as in the *physical* Laws, the means of diminishing the sum of human wretchedness.

I must make frequent appeals to the candor of my Readers. I am presuming to open a path hitherto unattempted. I dare not flatter myself with the belief that my progress and success keep pace with the ardor of my imagination, and the anticipations of my heart. But the imperfect materials which I have busied myself in collecting, may perhaps one day assist men of greater ability, and in a happier situation, in raising to Nature a temple more worthy of her. Recollect, my dear Reader, that all I promised you was the frontispiece and the ruins of it.

OF

OF CONFORMITY.*

Though Conformity be a perception of our reason, I place it at the head of physical Laws, because it is the first feeling which we endeavour to gratify in examining natural objects. Nay, there is a connection so intimate between the physical character of those objects, and the instinct of every being possessed of sensibility, that colour simply is sufficient to rouse the passions of animals. A red object puts the bull into a rage, and suggests to most fowls and fishes the idea of prey. The objects of Nature display in Man a feeling of a higher order, independent of his wants; it is that of conformity. It is by means of the multiplied conformities of Nature that Man has formed his own reason; for *reason* means nothing else but the *relation*, or *conformity*, of things that exist. Thus, for example, if I examine a quadruped, the

* I do not know any single word in our language which expresses closely the import of the French word *convenance*. It signifies *suitableness*, *correspondence*, the *exact* adaptation of one thing to another. I employ the term *conformity*, as coming the nearest to our Author's idea of any one that occurred to my mind. Whoever has attempted translation must frequently have felt the difficulty of rendering certain *words* by exactly equivalent *words*, though he was at no loss where general meaning and expression were concerned: for there is no perfect *convenance* between language and language. I wish it to be understood then, that wherever the word *conformity* occurs in the immediate sequel of this Translation, the meaning is a complete coincidence, congruity, or tallying of object with object, as a bone fitted to it's socket, as the undulations of a paper check to those of it's counter-check, as eye to eye, hand to hand, foot to foot; and it applies equally to natural and to moral objects.—H. H.

eye-

eye-lids, which it can raise or let fall at pleasure, present to me conformities with light; when I look at the form of his feet, I see a conformity to the soil which he is destined to inhabit. It is impossible for me to conceive a determinate idea of these, without combining on the subject various feelings of conformity, or the want of it. Nay, the most material objects, and such as have not in strictness of speech any decided form, cannot present themselves to us without those intellectual relations. A rustic grotto, or a steep rock, please or give pain according as they present to us the ideas of repose or of obscurity, of perspective or of precipice.

Animals have a sensibility only of objects which have particular conformities to their wants. It may be affirmed that they have in this respect a share of reason as perfect as our own. Had *Newton* been a bee, he could not with all his geometry have constructed his cell in a hive without giving it, as the honey-bee has done, six equal partitions. But Man differs from animals in his capacity of extending this sentiment of conformity to all the relations of Nature, however foreign they may be to his personal demands. It is this extension of reason which has procured for him by way of eminence the denomination of a rational animal.

It is unquestionably true that if all the particular rationality of all animals were united, the sum would probably transcend the general reason of Man; for human reason has devised most of it's arts and crafts entirely from an intimation of their productions; besides, all animals come into the world with their peculiar

culiar industry, whereas Man is under the necessity of acquiring his at the expense of much time and reflection; and, as I have just observed, by imitating the industry and skill of another. But Man excels them not only by uniting in himself alone the intelligence scattered over all the rest, but by his capability of rising upward to the source of all conformities, namely to GOD himself. The only character which essentially distinguishes Man from the animal is this, He is a religious Being.

No one animal partakes with him of this sublime faculty. It may be considered as the principal of human intelligence. By it man is exalted above the instinct of the beasts, so as to be enabled to form a conception of the general plans of Nature; and which led him to suppose an order of things, from having caught a glimpse of an Author. By it he was emboldened to employ fire as the first of agents, to cross the Ocean, to give a new face to the Earth by agriculture, to subject all animals to his empire, to establish Society on the basis of a religion, and to attempt to raise himself up to DEITY by his virtues. It was not nature, as is commonly believed, which first pointed out GOD to Man, but it is a sense of the DEITY in Man which has indicated to him the order of nature. The Savages are religious, long before they are Naturalists.

Accordingly, by the sentiment of this universal conformity, Man is struck with all possible conformities, though they may be foreign to him. He takes an interest in the history of an insect; and if his attention is not engaged in behalf of all the insects which

which surround him, it is because he perceives not their relations unless there be some *Reaumur* at hand to display them to him; or else the constant habit of seeing them renders them insipid; perhaps it may be some odious or contemptible prejudice; for he is affected still more by moral than by physical ideas, and by his passions more than by his reason.

We shall farther remark, that all the sentiments of conformity spring up in the heart of Man at the sight of some useful end, which frequently has no manner of relation to his own personal wants: it follows that Man is naturally good, for this very reason, that he is rational; seeing the aspect alone of a conformity, though entirely foreign to him, communicates a sense of pleasure. It is from this natural sentiment of goodness, that the sight of a well-proportioned animal conveys to us agreeable sensations, which increase in proportion as the creature unfolds it's instinct. We love to see a turtle even in an aviary; but that bird pleases still more when at large in the forest, uttering the murmurs of love from the top of an elm, or when we perceive her busily constructing in it a nest for her young with all the solicitude of her maternal tenderness.

Once more, it is from a result of this natural goodness that want of conformity communicates a painful sensation, which is always excited at sight of any thing incongruous. Thus we are shocked on looking at a monster. It gives us pain to see an animal wanting a foot or an eye. This feeling is independent of every idea of pain relatively to ourselves, let Philosophers say what they will; for we suffer in such a case though

though we are assured that the animal came into the world in that defective state. We are pained at the sight of incongruity, even in insensible objects. Withered plants, mutilated trees, an ill assorted edifice, hurt our feelings. These sensations are perverted or suppressed in Man only by prejudice or by education.

OF ORDER.

A series of conformities which have a common centre constitutes order. There are conformities in the members of an animal; but order exists only in the body. Conformity refers to the detail, and order to the combination. Order extends our pleasure by collecting a great number of conformities, and it fixes them by giving them a determination toward one centre. It discovers to us at once in a single object, a succession of particular conformities, and the leading conformity to which they all refer. Thus order gives us pleasure, as beings endowed with a reason which embraces all Nature; and it pleases us still more perhaps, as being weak and limited creatures, capable of taking in only a single point at once.

It gives us pleasure for example to view the relations between the proboscis of a bee and the nectareous juices of flowers; between those of her thighs hollowed into spoons, and bristled with hairs, to the fine powder of the stamina which she there collects; between those of her four wings, to the booty with which she is loaded, (a resource by nature denied to flies which travel without a burthen, and which for

this reason are furnished with two only;*) finally, the use of a long sting which she has received for the defence of her property, and all the conformities of the organs of this small insect, which are more ingenious and in much greater number than those of the largest animals.

But the interest grows upon us when we see her covered all over with a yellow powder, her thighs pendent, and half oppressed with her burden, directing her flight through the air, across plains, rivers, and shady groves, under points of the wind, with which she is well acquainted, and alighting with a humming sound on the cavernous trunk of some aged oak. Here again we perceive a successive order, on seeing a great multitude of little individuals similar to her, coming out and going in acccording as the business of the hive may require. That one, whose particular conformities we have been admiring is only a single member of a numerous Republic; and this Republic itself is but a small Colony of the immense Nation of bees, spread over the whole Earth, from the Line up to the shores of the Frozen Ocean.

This Nation again is subdivided into different species, conformably to the various species of flowers; for there are some which, being destined to live on flowers which have no depth, such as the radiated, are armed with five hooks, to prevent their sliding on the petals. Others on the contrary, such as the

* The ichneumon, or aquatic dragon-fly, is in like manner provided with four wings, because she too was intended to fly under a load. I have seen her catch butterflies in the air.

bees

bees of America, have no stings, because they construct their hives in the trunks of prickly trees, which are very common in that part of the world: such trees accordingly are their protection. There are many other conformities among the other species of bees with which we are totally unacquainted. Nevertheless this vast Nation, so varied in its Colonies, and whose possessions are so extensive, is but one little family of the class of flies of which we know in our own Climate alone, near six thousand species, most of them as distinct from each other, as to forms and instincts, as bees themselves are from other flies.

If we were to compare the relations of this volatile class, so numerous in itself, with all the parts of the vegetable and animal kingdoms, we should find an innumerable multitude of different orders of conformity; and were we to add to them those which are presented to us in the legions of butterflies, scarabs, locusts, and other insects which likewise fly, we should multiply them to infinity. All this still would be but a small matter, compared to the various industry of the other insects which crawl, which leap, which swim, which climb, which walk, which are motionless; the number of these is incomparably greater than that of the first: and the history of these last; added to that of the others, would after all be the history of only one puny race of this great Republic of the World, replenished as it is with innumerable shoals of fishes, and endless legions of quadrupeds, amphibious animals, and birds.

All other classes, with their divisions and subdivisions, the minutest individual of which presents a very

extensive sphere of conformities, are themselves only particular conformities; only rays and points in the general sphere, of which Man alone occupies the centre, and apprehends the immensity.

From a sense of the general order two other sentiments obviously result; the one which throws us imperceptibly into the bosom of the DEITY, and the other, which recals us to the perception of our wants; the one which exhibits to us as the original cause, a Being infinitely intelligent without us, and the other, as the ultimate end, a very limited being in our own person. These two sentiments characterize the two powers of which Man is constituted, the spiritual and the corporeal. This is not the place to unfold these; it is sufficient for my purpose to remark, that these two natural sentiments are the general sources of the pleasure which we derive from the order of Nature. Animals are affected only by the second, and that in a very limited degree.

A bee has a sentiment of the order of her hives, but she knows nothing beyond that. She is totally ignorant of the order which regulates the ants in their nest, though she may have frequently seen them prosecuting their labours. To no purpose would she resort, in the event of her hive's being destroyed, to seek refuge as a republican in the midst of their Republic. To no purpose, in the hour of distress, would she attempt to avail herself of the qualities which she has in common with them, and which make communities to flourish, temperance, a disposition to industry, the love of Country, and above all, that of equality, united to superior talents: she would

would meet from them with no hospitality, no consideration, no compassion. Nay, she would not find an asylum even among other bees of a different species: for every species has it's proper sphere assigned to it, and this by an effect of the wisdom of Nature; for if it were otherwise, the best organized species, or the strongest, would expel the others from their domains. Hence it follows, that the society of animals could not subsist independent of the passions, nor human society independent of virtue. Man alone, of all animals, possesses the sentiment of universal order, which is that of the DEITY himself; and by carrying over the whole Earth the virtues which are the fruits of it, whatever may be the differences which prejudice interposes between man and man, it is sure of alluring all hearts to itself. It was by this sentiment of universal order which governed your life, that you have become the men of all Nations, and that you interest us still, even when you are no longer with us, *Aristides*, *Socrates*, *Marcus-Aurelius*, divine *Fenelon*, and you, likewise, unfortunate *John James!*

HARMONY.

Nature opposes beings to each other, in order to produce between them agreeable conformities. This Law has been acknowledged from the highest Antiquity. It is to be found in many passages of the Holy Scriptures. I produce one from the Book of Ecclesiasticus:* *Omnia duplicia, unum contra unum, & non fecit quidquam deesse.* "All things are double,

* Ecclesiasticus, chap. xlii. ver. 24, 25.

"one against another; and He hath made nothing "unperfect: one thing establisheth the good of an- "other."

I consider this great truth as the key of all Philosophy. It has likewise been fruitful in discovery, as well as that other; *Nothing has been created in vain.* It has been the source of taste in the arts and in eloquence. Out of contraries arise the pleasures of vision, of hearing, of touching, of tasting, and all the attractions of beauty, of whatever kind it may be. But from contraries likewise arise ugliness, discord, and all the sensations which fill us with disgust. In this there is something very wonderful, that Nature should employ the same causes to produce effects so different. When she opposes contraries to each other, painful affectations are excited in us; but when she blends them, we are agreeably affected. From the opposition of contraries spring discord, and from their union results harmony.

Let us endeavour to find in Nature some proofs of this great Law. Cold is the opposite of heat, light of darkness, earth of water; and the harmony of these contrary elements produces effects the most delightful; but if cold succeeds rapidly to heat, or heat to cold, most vegetables and animals exposed to such sudden revolutions are in danger of perishing. The light of the Sun is agreeable; but if a black cloud suddenly intercepts, or bears upon the lustre of his rays, or if a gleaming flame, such as that of lightning, bursts from the bosom of a very dark night, the eye in both these cases undergoes a painful sensation. The horror of a thunder-storm is greatly increased,

creased, if the tremendous explosions are interrupted by intervals of profound silence; and it is heightened inexpressibly, if the oppositions of those celestial fires and obscurities, of that tumult and tranquility, make themselves felt in the gloom and silence of night.

Nature opposes, in like manner, at sea, the white foam of the billows to the black colour of the rocks, in order to announce to the mariners from afar the danger of shallows. She frequently presents to them forms analagous to destruction, such as those of ferocious animals, of edifices in ruin, or of the keels of ships turned upward. She even extracts from these awful forms hollow noises resembling groans, and broken off by long intervals of silence. The Ancients believed that they saw in the rock of Scylla a female of a hideous form, whose girdle was surrounded by a pack of dogs which barked incessantly. Mariners have given to the rocks of the Bahama channel, so noted for shipwrecks, the name of the *Martyrs*, because they present, through the spray of the billows which break on them, the horrid spectacle of men impaled, and exposed on wheels. You would even imagine that you heard sighs and sobbings issuing from these dismal shallows.

Nature employs in like manner those clashing oppositions, and those ominous signs, to express the characters of savage and dangerous animals of all kinds. The lion strolling by night through the solitudes of Africa, announces his approach from a great distance, by roarings which have a striking resemblance to the rolling of thunder. The vivid and instanta-

neous flashes of fire which dart from his eyes in the dark, exhibit besides the appearance of that formidable meteor, lightning. During the Winter season the howlings of the wolves in the forests of the North resemble the whistling of the winds as they agitate the trees; the cries of birds of prey are shrill, piercing, and now and then interrupted by hollow notes. Nay, there are some which emit the sounds of a human being in pain. Such is the lom, a species of sea-fowl, which feeds on the shelvy coast of Lapland,* on the dead bodies of animals which are there put ashore: he cries like a man a-drowning.

Noxious insects exhibit the same oppositions, and the same signals of destruction. The gnat thirsting after human blood, announces himself to the eye by the white points with which his brown-coloured body is studded, and to the ear by his shrill notes, which disturb the tranquility of the grove. The carnivorous wasp is speckled, like the tiger, with black stripes on a yellow ground. You frequently find in our gardens, about the roots of trees which are decaying, a species of bug, of a longish form, which bears on it's red body marbled with black, the mask of a death's head. Finally, the insects which attack our persons more immediately, however small they may be, distinguish themselves by glaring oppositions of colour to the field on which they settle.

But when two contraries come to be blended, of whatever kind, the combination produces pleasure, beauty and harmony. I call the instant, and the point of their union: *harmonic expression.* This is the

* See *John Schaffer's* History of Lapland.

only

only principle which I have been able to perceive in Nature; for the elements themselves, as we have seen, are not simple: they always present accords formed of two contraries to analyses multiplied without end. Thus, to resume some of the instances already adduced, the gentlest temperatures, and the most favourable in general to every species of vegetation, are those of the seasons in which cold is blended with heat, as in the Spring and Autumn. They are then productive of two saps in trees, which the strongest heats of Summer do not effect. The most agreeable production of light and darkness are perceptible at those seasons when they melt into each other, and form what Painters call the *clear-obscure* and *half-lights*. For this reason it is, that the most interesting hours of the day are those of morning and evening: those hours, when in the beautiful imagery of *La Fontaine*, in his charming fable of *Pyramus* and *Thisbe*, the shade and the light strive for the mastery of the azure fields. The most lovely prospects are those in which land and water are lost in each other; this suggested that observation of honest *Plutarch*; namely, that the pleasantest land-journies are those which we make along the shore of the sea; and the most delightful voyages those which are a coasting along the land. You will observe these same harmonies result from savours and sounds the most opposite, in the pleasures of the palate and of the ear.

We shall proceed to examine the uniformity of this Law, in the very principles by which Nature gives us the first sensations of her works, which are colours, forms, and motions.

OF

OF COLOURS.

I shall be carefully on my guard not to give a definition of colours, and still more, not to attempt an explanation of their Origin. Colours are, as Naturalists tells us, refractions of the light on bodies, as is demonstrated by the prism, which by breaking a ray of the Sun, decompounds it into seven coloured rays, and these display themselves in the following order; red, orange, yellow, green, blue, indigo, and violet. These are, as they will have it, the seven primitive colours. But, as has been already observed, We do not know what is primitive in Nature. I might object to them, that if the colours of objects are produced only from the refraction of the light of the Sun, they ought to disappear at the light of a taper, for the light of a taper is not decompounded by the prism: but I shall confine myself to a few reflections respecting the number and the order of those seven pretended primitive colours.

First, it is evident that four of these are compounded; for orange is made up of yellow and red; green of yellow and blue; violet, of blue and red; and indigo is nothing more than a tint of blue surcharged with black. This reduces the solar colours to three primordial; namely, yellow, red, and blue; to which if we add white, which is the colour of light, and black, which is the privation of it, we shall have five simple colours with which may be compounded all imaginable shades of colour.

I must here observe, that our philosophical machinery deceives us with it's affectation of superior intel-

intelligence, not only because it ascribes false elements to Nature, as when the prism displays compound for primitive colours, but by stripping her of such as are true; for how many white and black bodies must be reckoned colourless, considering that this same prism does not exhibit their tints in the decomposition of the solar ray!

This instrument leads us farther into an error respecting the natural order of these very colours, by making the red ray the first in the series, and the violet ray the last. The order of colours in the prism therefore is only a triangular decomposition of a ray of cylindrical light, the two extremities of which, red and violet, participate the one of the other, without terminating it; so that the principle of colours, which is the white ray, and it's progressive decomposition, is no longer manifested in it. I am very much disposed to believe, that it is even possible to cut out a crystal with such a number of angles, as would give to the refractions of the solar ray an order entirely different, and would multiply the pretended primitive colours far beyond the number of seven. The authority of such a polyedron would become altogether as respectable as that of the prism, if the Algebraists were to apply to it a few calculations somewhat obscure, with a seasoning of the ratiocination of the corpuscular philosophy, as they have done with regard to the effects of the triangular instrument.

We shall employ a method not quite so learned, to convey an idea of the generation of colours, and of the decomposition of the solar ray. Instead of examining them in a prism of glass, we shall consider them

them in the Heavens, and there we shall behold the five primordial colours unfold themselves in the order which we have indicated.

In a fine Summer's night, when the sky is serene, and loaded only with some light vapours, sufficient to stop and to refract the rays of the Sun, as they traverse the extremities of our Atmosphere, walk out into an open plain, where the first fires of *Aurora* may be perceptible. You will first observe the Horizon whiten at the spot where she is to make her appearance; and this kind of radiance, from it's colour, has procured for it, in the French language, the name of *aube* (the dawn) from the Latin word *alba*, which signifies white. This whiteness insensibly ascends in the Heavens, and assumes a tint of yellow, some degrees above the Horizon; the yellow, as it rises some degrees higher, passes into orange; and this shade of orange rises upward into the lively vermillion, which extends as far as the Zenith. From that point you will perceive in the Heavens, behind you, the violet succeeding the vermillion, then the azure, after it the deep blue or indigo colour, and last of all, the black quite to the westward.

Though this display of colours presents an infinite multitude of intermediate shades, which succeed each other with considerable rapidity, nevertheless there is a moment, and if my recollection of it be accurate, it is the moment when the Sun is just going to exhibit his disk, that the dazzling white is visible in the Horizon, the pure yellow, at an elevation of forty-five degrees; the fire colour in the Zenith; the pure blue forty-five degrees under it, toward the West,

and

and in the very West, the dark veil of night still lingering on the Horizon. At least I think I have remarked this progression between the Tropics, where there is scarcely any horizontal refraction to make the light prematurely incroach on the darkness, as in our Climates.

J. J. Rousseau observed to me one day, that though the field of those celestial colours be blue, the yellow tints which melt away into it do not produce by that mixture the colour of green, as is the case in our material colours, when these two shades are blended. But I replied, that I had frequently perceived green in the Heavens, not only between the Tropics but over the Horizon of Paris. That colour in truth is hardly ever seen with us, but in some fine Summer evenings. I have likewise seen, in the clouds of the Tropics, all the colours perceptible on the earth, particularly at sea, and in stormy weather. You may then see some of them copper-coloured, some of the colour of the smoke of a tobacco-pipe, some brown, reddish, black, grey, chestnut, livid, the colour of a heated oven's mouth. As to those which appear there in fine weather, some are so lively and brilliant that no palace can exhibit any thing to vie with them, were it enriched with all the gems of the Great Mogul.

Sometimes the trade-winds from the North-east or South-east, which constantly blow there, card the clouds through each other like so many tufts of silk; then sweep them away to the West, crossing and re-crossing them over one another, like the osiers interwoven in a transparent basket. They throw over the sides

sides of this chequered work, the clouds which are not employed in the contexture, and which are in no small number, roll them up into enormous masses, as white as snow, draw them out along their extremities in form of a crupper, and pile them upon each other like the Cordeliers of Peru, moulding them into the shape of mountains, of caverns and of rocks; afterwards, as evening approaches, they grow somewhat calm, as if afraid of deranging their own workmanship. When the Sun comes to set behind this magnificent netting, you see a multitude of luminous rays transmitted through each particular interstice, which produce such an effect, that the two sides of the lozenge illuminated by them, have the appearance of being begirt with a fillet of gold, and the other two, which are in the shade, seem tinged with a superb ruddy orange. Four or five divergent streams of light, emanated from the setting Sun up to the Zenith, clothe with fringes of gold the undeterminate summits of this celestial barrier, and proceed to strike with the reflexes of their fires the pyramids of the collateral aërial mountains, which then appear to consist of silver and vermillion. At this moment of the evening are perceptible, amidst their redoubled ridges, a multitude of valleys extending into infinity and distinguishing themselves at their opening by some shade of flesh or of rose-colour.

These celestial valleys present, in their different contours, inimitable tints of white, melting away into white, or shades lengthening themselves out, without mixing over other shades. You see here and there issuing from the cavernous sides of those mountains, tides

tides of light precipitating themselves in ingots of gold and silver, over rocks of coral. Here it is a gloomy rock, pierced through and through, disclosing beyond the aperture the pure azure of the firmament; there it is an extensive strand, covered with sands of gold, stretching over the rich ground of Heaven; poppy-coloured, scarlet, and green as the emerald.

The reverberation of those western colours diffuses itself over the Sea, whose azure billows it glazes with saffron and purple. The mariners, leaning over the gunwale of the ship, admire in silence those aërial landscapes. Sometimes this sublime spectacle presents itself to them at the hour of prayer, and seems to invite them to lift up their hearts with their voices to the Heavens. It changes it's appearance every instant: what was just now luminous, becomes in a moment coloured simply; and what is now coloured will by and by be in the shade. The forms are as variable as the shades; they are by turns islands, hamlets, hills clothed with the palm-tree; vast bridges stretching over rivers; fields of gold, of amethysts, of rubies, or rather nothing of all this; they are celestial colours and forms which no pencil can pretend to imitate, and which no language can describe.

It is very remarkable, that all travellers who have at various seasons ascended to the summits of the highest mountains on the Globe, between the Tropics and beyond them, in the heart of the Continent, or in Islands, never could perceive, in the clouds below them, any thing but a gray and lead-coloured surface, without any variation whatever as to colour, being always

always similar to that of a lake. The Sun notwithstanding illuminated those clouds with his whole light; and his rays might there combine, without obstruction, all the laws of refraction to which our systems of Physics have subjected them. From this observation it follows, and I shall repeat it in another place, because of it's importance, that there is not a single shade of colour employed in vain, through the whole extent of the Universe; that those celestial decorations were made for the level of the Earth, and that their magnificent point of view is taken from the habitation of Man.

These admirable concerts of lights and forms which manifest themselves only in the lower region of the clouds, the least illuminated by the Sun, are produced by laws with which I am totally unacquainted. But let their variety be what it may, the whole are reducible to five colours; yellow appears to be a generation from white: red a deeper shade of yellow; blue, a tint of red greatly strengthened; and black, the extreme tint of blue. It is impossible to entertain a doubt respecting this progression, if you observe in the morning, as I have mentioned, the expansion of the light in the Heavens. You there see those five colours, with their intermediate shades, generating each other nearly in this order: white, sulphur yellow, lemon yellow, yolk of egg yellow, orange, aurora colour, poppy red, full red, carmine red, purple, violet, azure, indigo and black. Each of those colours seems to be only a strong tint of that which precedes it, and a faint tint of that which follows;

lows; thus the whole together appear to be only modulations of a progression, of which white is the first term, and black the last.

In this order, whereof the two extremes, white and black, that is, light and darkness, produce, in harmonizing so many different colours, you will remark, that the red colour holds the middle place, and that it is the most beautiful of the whole in the judgment of all Nations. The Russians, when they would describe a beautiful girl, say she is red. They call her *crastna dévitsa*: red and beautiful being with them synonymous terms. In Mexico and Peru red was held in very high estimation. The most magnificent present which the Emperor *Montezuma* could devise for *Cortez* was a necklace of lobsters, which naturally had that rich colour.* The only demand made upon the Spaniards by the King of Sumatra, on their first landing in his country, and presenting him with many samples of the commerce and industry of Europe, was some corals and scarlet-coloured stuffs;† and he promised to give them in return all the spiceries, and other merchandize of India, for which they might have occasion.

There is no such thing as carrying on trade to any advantage with the Negroes, the Tartars, the Americans, and the East-Indians, but through the medium of red cloths. The testimonies of travellers are unanimous respecting the preference universally given to this colour. Of this I could produce proofs innumerable, were I not afraid of being tedious. I have in-

* See Herrara.

† See General History of Voyages by the Abbé *Prevost*.

dicated the universality of this taste, merely in the view of demonstrating the falsehood of the philosophic axiom, which asserts that tastes are arbitrary, or which amounts to the same thing, that there are in nature no laws for beauty, and that our tastes are the effects of prejudice. The direct contrary of this is the truth; it is prejudice that corrupts our natural tastes which would otherwise be the same over the whole Earth. From a prejudice of this kind the Turks prefer green to every other colour, because, according to the tradition of their Theologians, this was the favourite colour of *Mahomet*, and his descendants alone, of all the Turks, have the privilege of wearing the green turban.

But from a similar though opposite prejudice, the Persians, their neighbours despise green, because they reject the traditions of those Turkish Theologians, and accordingly do not acknowledge that consanguinity of their Prophet, being followers of *Ali*.

From another chimera, yellow appears to the Chinese the most distinguished of all colours, because it is that of their emblematical dragon. Yellow is, in China, the imperial colour, as green is in Turkey. The Chinese nevertheless, if we may depend on the authority of *Isbrantes-Ides*, represent their Gods and Heroes on the stage with their faces stained a blood colour.* All these Nations, the political colour excepted, consider red as the most beautiful, which is sufficient to establish, with respect to it, an unanimity of preference.

But without dwelling longer on the variable tes-

* Journey from Moscow to China, page 141.

timony

timony of Man, we have only to appeal to that of Nature. It is with red that Nature heightens the most brilliant parts of the most beautiful flowers. She has given a complete clothing of it to the rose, the Queen of the Garden: she has bestowed this tint on the blood, which is the principle of life in animals: she invests most of the feathered race in India with a plumage of this colour, especially in the season of love. There are very few birds on which she does not then bestow some shade at least of this rich hue. Some have their heads covered with it, such as those which are called Cardinals; others have a breast-plate of it, a necklace, a capuchin, a shoulder-knot. There are some which preserve entirely the gray or brown ground of their plumage, but glazed over with red, as if they had been rolled in carmine. Others are besprinkled with red, as if you had blown a scarlet powder over them. Together with this, some have a mixture of small white points, which produces a charming effect. A little bird of India, called *Bengali*, is painted in this manner.

But nothing can be more lovely than a turtle-dove of Africa, who bears on her pearl-gray plumage precisely over the place of the heart, a bloody spot, consisting of different kinds of red blended, perfectly resembling a wound: it seems as if this bird, dedicated to Love, was destined to wear her master's livery, and had served as a mark to his arrows. What is still more wonderful, these rich coraline tints disappear in most of those birds as soon as the season of love is over, as if they were robes of ceremony,

lent them by the benevolence of Nature only during the celebration of their nuptials.

The red colour, situated in the midst of the five primordial colours, is the harmonic expression of them by way of excellence; and the result, as has been said, of the union of two contraries, light and darkness. There are besides, tints extremely agreeable, compounded of the oppositions of extremes. For example, of the second and fourth colour, that is, of yellow and blue, is formed green, which constitutes a very beautiful harmony, and which ought perhaps to possess the second rank in beauty among colours, as it possesses the second in their generation. Nay, green appears in the eyes of many persons, if not the most beautiful tint, at least the most lovely, because it is less dazzling than red, and more congenial to the eye.*

I shall

* It is harmony which renders every thing perceptible, just as monotony makes every thing to disappear. Not only are colours the harmonic consonances of light: but there is no one coloured body whose tint Nature does not heighten by the contrast of the two extreme generative colours, which are white and black. Every body detaches itself by means of light and shade, the first of which is a-kin to the white, and the second to the black. Every body accordingly bears upon it a complete harmony.

This is not the effect of chance. Were we enlightened, for example, by a luminous air, we should not perceive the form of bodies; for their outlines, their profiles, and their cavities, would be overspread with an uniform light, which would cause their prominent and retreating parts to disappear. With a providence, therefore, completely adapted to the weakness of our vision, the Author of Nature has made the light to issue from a single point of Heaven: and with an intelligence that equally challenges our admiration, He has given a motion of progression to the Sun, who is the

I shall insist no longer on the other harmonic shades which may be deduced, in conformity to the laws of their generation, from colours the most opposite; and of which might be formed accords and concerts, such as Father *Castel* produced from his celebrated Harpsichord. I must however remark, that colours may have a powerful influence on the passions; and that they, as well as their harmonies, may be referred to the moral affections. For example, making red the point of departure, which is the harmonic colour super-eminently, and proceeding toward white in an ascending progression, the

the source of that light, in order to form with the shades, harmonies varying every instant. He has likewise modified that light on terrestrial objects in such a manner, as to illuminate both immediately and mediately, by refraction and by reflection, and to extend it's tints and it's harmonies, with those of shade, in a way that no words can express.

J. J. Rousseau one day made this observation: "Painters can "give the appearance of a body in relief, to a smooth surface; I "should be very glad to see them give the appearance of a smooth "surface to a raised body." I made no reply at the moment; but having since reflected on the solution of this problem in optics, I by no means consider the thing as impossible. The whole that is necessary, according to my idea, is to destroy one of the harmonic extremes which render bodies prominent. For instance, if the object aimed at, were to flatten a bass-relief, it would be necessary to paint the cavities white or the prominent parts black. Accordingly, as they employ the harmony of the clare-obscure, to give the appearance of a solid body to a plane surface, they might employ the monotony of one single tint to make what is actually raised and solid to disappear, and become to the eye a plain surface. In the first case, painting renders that visible which is not tangible; in the second, we should have a body that might be touched without being visible. This last deception would be fully as surprizing as the other.

nearer you approach to this first term, the more lively and gay are the colours. You will have in succession the poppy, the orange, the yellow, the lemon, the sulphur, the white. On the contrary, the farther you proceed from red toward black, the sadder and more lugubrious are the colours; for this is the progression; purple, violet, blue, indigo, and black.

In the harmonies which may be formed on both sides by the union of opposite colours, the more that the tints of the ascending progression predominate, the more lively will be the harmonies produced; and the contrary will take place, in proportion as the colours of the descending harmony shall prevail. From this harmonic effect it is that green, being compounded of yellow and blue is so much more gay, as the yellow has the ascendant, and sad in proportion as the blue predominates.

Farther, from this harmonic influence it is, that white transfuses most gaiety into all other tints, because it is light itself. Nay, it produces, from opposition, a most delightful effect in the harmonies, which I call melancholy; for, blended with violet, it gives the delicious hue of the lilach flower; mixed with blue it makes azure, and with black produces pearl-gray; but melted away into red, it exhibits the rose-colour, that enchanting tint which is the flower of life. On the other hand, according to the predominance of black in colours which are gay, the effect produced is more mournful than would have resulted from unmixed black. This becomes perceptible on blending it with yellow, orange, and red, which are thereby rendered dull and gloomy colours. Red

gives

gives life to every tint into which it is infused, as white communicates gaiety, and black sadness.

If you would wish to produce effects entirely opposite to most of those which I have been just indicating, you have only to place the extreme colours closely by each other, without mingling them. Black opposed to white, produces the most mournful and the harshest effect. Their opposition is a badge of mourning among most Nations, as it is the signal of impending destruction in the tempestuous appearances of the Heavens, and in the commotions of the Ocean. The yellow too, opposed to black, is the characteristic of many dangerous animals, as the wasp, the tyger, and several others.....I do not pretend to insinuate that the women have not the skill of employing to advantage, in their dress, those opposite colours; but they are called in as an embellishment only on account of the contrasts which they form with the colour of their complexion; and as the red predominates there, it follows that the opposite colours are advantageous to them, for harmonic expression is never stronger than when found between the two extremes which produce it. We shall offer a few thoughts hereafter on this part of Harmony, when we come to speak of contrasts, and of the human figure.

It would be ridiculous to affect ignorance of the objections which may be started against the universality of these principles. We have represented white as a gay, and black as a sad colour. Nevertheless certain Negro Nations represent the Devil as white;

the inhabitants of the Peninsula of India, in token of mourning, rub their forehead and temples with the powder of Sandal-wood, the colour of which is a yellowish white. The Navigator *La Barbinois*, who in his voyage round the world has as well described the manners of China as those of our sea-officers and of several European Colonies, says that white is the colour of mourning among the Chinese. From these instances it might be concluded, that the feeling of colour must be arbitrary, as it is not the same in all Nations.

I venture to offer the following reply to these objections. It has already been proved by evidence, that the Nations of Africa and Asia, however black they may be, prefer white women to those of every other tint. If there be any Negro Nations who paint the Devil white, this may be easily accounted for, from the strong feeling which they have of the tyranny which the whites exercise over them. White accordingly having become with them a political colour, ceases to be a natural one. Besides, the white in which they paint their Devil is not a white, beautifully harmonious like that of the human figure, but a dead white, a chalk white, such as that with which our painters illuminate the figures of phantoms and ghosts in their magical and infernal scenes.

If this dazzling colour is the expression of mourning among the Indians and Chinese, the reason is it contrasts harshly with the black skin of those Nations. The Indians are black. The skin of the southern Chinese is much sun-burnt. They derive their religion

gion and their leading customs from India, the cradle of the Human Race, the inhabitants of which are black. Their outward garments are of a gloomy colour; a great part of their dress consists of black sattin; the covering for their under extremities is black boots; the ornamental furniture of their houses consists, in a great measure, of that beautiful black varnished ware which we import from their country. White must therefore produce a harsh dissonance with their furniture; their dress, and above all, with the dusky colour of their skin.

If those nations were to wear a black habit in mourning, as we do, be their colour ever so deep, it would not form a clashing opposition in their dress. The expression of grief, accordingly, is precisely the same with them as with us. For if we, in a season of mourning, oppose the black colour of our clothes to the white colour of our skin, in order thence to produce a funeral dissonance, the southern Nations oppose, on the contrary, the white colour of their garments to the dusky colour of their skin, in order to produce the same effect.

The variety of taste admirably confirms the universality of the principles which we have laid down respecting the causes of harmony and dissonance. It farther demonstrates, that the agreeableness or disagreeableness of a colour resides not in one single shade, but in the harmony, or in the clashing contrast of two opposite colours.

We might find proofs of those laws multiplied without end in Nature, to which Man ought never to have recourse in all his doubts. She opposes harshly,

in

in hot countries as in cold, the colours of dangerous and destructive animals. Venomous reptiles are universally painted in gloomy colours. Birds of prey are universally of an earthly hue opposed to yellow, and white specks on a dark ground, or dark spots on a light ground. Nature has given a yellow robe, striped with dusky brown, and sparkling eyes, to the tyger lying in ambush under the shade of the forests of the South: and she has tinged with black the snout and paws, and with blood-colour the throat and eyes of the white bear, and thereby renders him apparent, notwithstanding the whiteness of his fur, amidst the snows of the North.

OF FORMS.

Let us now proceed to the generation of forms. If I am not mistaken, the principles of these, like those of colours, are reducible to five, namely, the line, the triangle, the circle, the ellipse, and the parabola.

The line generates all forms, as the ray of light does all colours. It goes on progressively, like the other, in it's generations, step by step, producing, first, by three fractions, the triangle which of all figures contains the smallest surfaces under the greatest of circuits. The triangle afterward, composed itself of three triangles at the centre, produces the square, which consists of four triangles from the central point; the pentagon, which consists of five; the hexagon, which consists of six; and so of the rest of the polygons, up to the circle, which is composed of a multitude of triangles, whose summits are at it's centre, and the bases at it's circumference: and which,

contrary

contrary to the triangle, contains the greatest of surfaces under the smallest of peripheries. The form which has hitherto always been going on progressively, commencing with the line relatively to a centre, up to the circle, afterwards deviates from it, and produces the ellipse, then the parabola, and finally all the other widened curves, the equations of which may all be referred to this last.

So that under this aspect the indefinite line has no common centre: the triangle has three points in it's bounding lines, which has a common centre; the square has four, the pentagon five, the hexagon six, and the circle has all the points of it's circumference regulated conformably to one common and only centre. The ellipse begins to deviate from this regulation, and has two centres; and the parabola, as well as the other curves which are analogous to it, have centres innumerable contained in their several axes, from which they remove farther and farther, forming something like funnels.

On the supposition of this ascending generation of forms, from the line through the triangle up to the circle, and their descending generation from the circle through the ellipse to the parabola, I deduce from these five elementary forms all the forms of Nature, as with five primordial colours I compose all the possible shades of colour.

The line presents the slenderest form, the circle presents the fullest, and the parabola the most obliquely fluted. In this progression it may be remarked, that the circle which occupies the middle between these two extremes is the most beautiful of all

all the elementary forms, as red is the most beautiful of all the primordial colours. I presume not to say, with certain ancient Philosophers, that this form must be the most beautiful, because it is the figure of the Stars, which, however, would be no such contemptible reason; but, to employ only the testimony of our senses, it is the most grateful to both the eye and the touch; it is likewise the most susceptible of motion; finally, what is no mean authority in the case of natural truths, it is considered as the most conformable to the taste of all Nations, who employ it in their ornaments and in their architecture; and it is particularly conformable to the taste of children, who give it the preference to every other, in the instruments of their amusement.

It is very remarkable, that these five elementary forms have the same analogies to each other which the five primordial colours have among themselves; so that if you proceed to their ascending generation, from the sphere toward the line, you will have forms angular, lively, and gay, which shall terminate in the straight line, and of which Nature composes so many radiations and expansions of figure, in the Heavens and on the Earth, so agreeable to behold. If, on the contrary, you descend from the sphere to the excavations of the parabola, you will be presented with a gradation of cavernous forms, which are so frightful in abysses and precipices.

Farther, if you join the elementary forms to the primordial colours, term for term, you will observe their principal character mutually strengthen each other, at least in the two extremes, and in the harmonic

monic expression of the centre: for the two first terms will give the white ray, which is the ray of light itself; the circular form, united to the red colour, will produce a figure analogous to the rose, composed of spherical portions with carmine tints, and from the effect of this double harmony deemed, in the judgment of all Nations, the most beautiful of flowers. Finally black, added to the vacuity of the parabola, increases the gloom of retreating and cavernous forms.

With these five elementary forms may be composed figures as agreeable as the shades which are produced from the harmonies of the five primordial colours. So that the more there shall enter into those mixed figures, of the two ascending terms of the progression, the more light and gay such figures will be; and the more that the two descending terms shall predominate, the more heavy and dull will be the forms. Thus the form will be so much the more elegant, as the first term, which is the straight line, shall have the predominance. For example, the column gives us pleasure, because it is a long cylinder, which has the circle for it's basis, and two straight lines, or a quadrilateral figure of considerable length, for it's elevation. But the palm-tree, of which it is an imitation, pleases still more, because the stellated and radiating forms of it's palms, likewise taken from the straight line, constitute a very agreeable opposition with the roundness of its stem; and if to this you unite the harmonic form by way of excellence, namely, the circular, you will add inexpressibly to the grace of this beautiful tree. This likewise Nature, who

who knows much more of the matter than we, has taken care to do, by suspending, at the basis of it's divergent boughs, sometimes the oval date and sometimes the rounded cocoa-nut.

In general, as often as you employ the circular form you will greatly enhance the agreeableness of it, by uniting it with the two contraries of which it is composed; for you will then have a complete elementary progression. The circular form alone presents but one expression, the most beautiful of all, in truth; but united to it's two extremes, it forms, if I may so express myself, an entire thought. It is from the effect which thence results, that the vulgar consider the form of the heart to be so beautiful, as to compare to it every other beautiful and interesting object. That is beautiful as a heart, say they.* This heart-form consists at it's basis of a projecting angle, and above of a retreating angle; there we have the extremes; and in it's collateral parts of two spherical portions; there is the harmonic expression.

It is farther from these same harmonies that long ridges of mountains, overtopped by lofty peaks of a pyramidical form, separated from each other by deep valleys, delight us by their gracefulness and majesty. If to these you add rivers meandering below, radiating poplars waving on their banks, flocks of cattle and

* Is not our Author here indulging fancy, rather than following Nature? If this be an idea and expression of the common people, it must be the commonalty of a particular country. *Heart* is, perhaps, universally used to express fondness, affection, desire; but to represent the *form* of that organ as *beautiful*, nay the *essence* of beauty, is surely a violent stretch of imagination.—H. H.

shepherds,

shepherds, you will have vales similar to that of Tempe. The circular forms of the mountains in such a landscape are placed between their extremes, namely, the prominency of the rocks and the cavity of the valleys. But if you separate from it the harmonic expressions, that is, the circular wavings of those mountains, together with their peaceful inhabitants, and allow the extremes only to remain, you will then have the dreary prospect of Cape-Horn; angular, perpendicular rocks, hanging over fathomless abysses.

If to these you add oppositions of colour, as that of snow on the summits of the dusky rocks, the foam of the billows breaking on the lurid shore, a pale sun in a gloomy sky, torrents of rain in the midst of Summer, tremendous squalls of wind succeeded by sullen calms, a European vessel on her way to spread desolation over the islands of the South-Sea,* running upon a rock when it is beginning to grow dark, firing from time to time guns the signal of distress, the noise of which the echoes of those horrid deserts reverberate, the terrified Patagonian running in amazement to his cave, and you will have a complete view of that land of desolation, covered over with shades of death.

* Would not the effect of this dreadful picture have been considerably strengthened, had our Author represented his European vessel as attempting to double Cape-Horn, *on her return* from spreading devastation over the South-Seas, and making shipwreck on that dreary coast, *after* the scene of blood was acted? In this case we should have had the striking and instructive representation of the connection between Human Guilt and Divine Justice; of the clashing collision of criminality and vengeance.—H. H.

OF

OF MOVEMENTS.

It remains that I suggest a few reflections on the subject of motions. Of these we shall in like manner distinguish five which are fundamental: self-motion, or the rotation of a body round itself, which supposes no change of place, and which is the principle of all motion; such is perhaps that of the Sun; after that, the perpendicular, the circular, the horizontal, and the state of rest. All movements whatever may be referred to these five. Nay you will remark that Geometricians, who represent them likewise by figures, suppose the circular motion to be generated of the perpendicular and the horizontal, and to make use of their language, produced by the diagonal of their squares.

I shall not insist on the analogies of the generation of colours and forms to those of the generation of movements; and which actually exist between the white colour, the straight line, and self motion, or rotation; between the red colour, and spherical form, and circular motion; between darkness, vacuity, and rest. I shall not pretend to unfold the infinite combinations which might result from the union or opposition of the corresponding terms of each generation, and of the filiations of these same terms. I leave to the Reader the pleasure of following up this idea, and of forming to himself, with these elements of Nature, harmonies the most enchanting, with the additional charm of novelty. I shall confine myself at present to a few hasty observations respecting motion.

Of all movements the harmonic or circular motion

tion, is the most agreeable. Nature has diffused it over most of her works, and has rendered even the vegetables which are fastened down to the earth, susceptible of it. Our plains present frequent images of this, when the winds form, on the meadow, or on the corn-field, a series of undulations resembling the waves of the sea; or when they gently agitate on the sides of the lofty mountains, the towering tops of the trees, waving them about in segments of a circle. Most birds form portions of great circles as they play through the airy expanse, and seem to take pleasure in tracing, as they fly, an infinite variety of curves and spiral motions. It is remarkable that Nature has bestowed this agreeable style of flying on many of the inoffensive species of the feathered race, not otherwise to be prized for the exquisiteness of either their song or their plumage. Such among others is the flight of the swallow.

The case is very different with respect to the progressive movements of ferocious or noxious animals. They advance leaping, springing, and join to movements sometimes extremely slow, others violently rapid: this is observable in the motion of the cat lying in wait to catch a mouse. Those of the tyger are exactly similar, in his approaches upon his prey. The same discordancy is observable in the flight of carnivorous birds. The species of owl called the grand-duke floats thorugh the midst of a tranquil sky, as if the wind carried him this way and that. Tempests present, in the Heavens, the same characters of destruction. You sometimes perceive the stormy clouds moving in opposite directions, and with various de-

grees of velocity; now they fly with the rapidity of lightning, while others remain immoveable as the rock. In the tremenduous hurricanes of the West-Indies, the explosion is always preceded and followed by a dead calm.

The more that a body possesses of self-motion, or of rotation, the more agreeable it appears, especially when to this movement is united the harmonic or circular motion. It is for this reason that trees whose leaves are immoveable, such as the aspin and poplar, have more grace than other forest trees when agitated by the wind. They please the eye by the balancing of their tops, and by presenting in turns the two surfaces of their foliage, which display two different greens. They are likewise agreeable to the ear, from their imitation of the bubbling of water. From the effect of self-motion it is, that, every moral idea out of the question animals interest us more than vegetables, because they have the principle of motion within themselves.

I do not believe there is a single spot on the Earth in which there is not some body in motion. Frequently have I been in the midst of vast solitudes, by day and by night, and in seasons of perfect tranquillity, and I have heard always some noise or another. Often in truth it was only the sound of a bird flying, or of an insect stirring a leaf; but sound always supposes motion.

Motion is the expression of life. In this you see the reason why Nature has multiplied the causes of it in all her works. One of the great charms of a landscape is to see objects in motion; and this is the very

very thing which the pictures of most of our great Masters frequently fail to express. If you except such of them as represent tempests, you will find every where else their forests and their meadows motionless, and the water of their lakes congealed. Nevertheless, the inversion of the leaves of trees presenting a grey or white underside; the undulations of the grass in the valleys and on the ridges of the mountains; those which ruffle the smooth surface of the waters and the foam which whitens the shores, recal with inexpressible pleasure, in a burning summer-scene, the breath so gentle, and so cooling of the zephyrs. To these might be added, with infinite grace and with powerful effect, the movements peculiar to the animals which inhabit them; for example, the concentric circles which the diving-bird forms on the surface of the water; the flight of a sea-fowl taking it's departure from a hillock, with neck advancing and legs thrown backward, and of two white turtles skimming side by side in the shade along the skirts of a forest; the balancing of a wag-tail on the extremity of the foliage of a rush, bending under his weight. It might be possible even to represent the motion and the weight of a loaded carriage toiling up a hill, by expressing the dust of the crushed pebbles which rises up behind it's wheels. Nay, I will go as far so to say, that I think the effects of the singing of birds, and of the echoes, might be rendered perceptible, by the expression of certain characters which it is not necessary here to unfold.

So far are most of our Painters, even among those whose talents are most conspicuous, from paying at-

tention to accessories so agreeable, that they omit them in subjects of which those accessories form the principal character. For example, if they represent a chariot at full speed, they take pains to exhibit every spoke of the wheels. The horses indeed are galloping, but the chariot is immoveable. The wheels of a carriage however that is running with a rapid motion, present but one single surface; all their spokes are confounded to the eye. It was not thus that the Ancients, our masters, in every branch of Art, imitated Nature. *Pliny* tells us that *Apelles* had so exactly painted chariots with four horses, that the wheels appeared to be turning round. In the curious list which he has transmitted to us of the most celebrated pictures of antiquity, and still viewed with admiration at Rome in his time, he particularly mentions one which represented women spinning wool, whose spindles seemed actually to whirl. Another was held in high estimation,* "in which were represented two "light-armed soldiers, the one of whom is so heated "with running in battle, that you see him sweat; and "the other who is laying down his arms, appears so "exhausted that you imagine you hear him panting." I have seen in many modern pictures machines in motion, wrestlers and warriors in action, but in no one of them did I ever find attention paid to these effects so simple and so expressive of the truth of Nature. Our painters consider them as petty details, beneath the notice of a man of genius. Nevertheless these petty details are traits of character. *Marcus Aurelius*, who possessed fully as much genius

* *Pliny's* Natural History. Book xxxvii. chap. 10. and 11.

as

as any modern whatever, has very judiciously observed, that in many cases it is on such minutenesses the attention fixes, and from the contemplation of these the mind derives the most pleasure. "The "sight of the shrivelling ripe figs," says he, "the "bushy eye-brows of a lion, the foaming of an en- "raged wild-boar, the reddish scales which rise on the "crust of bread coming out of the oven, give plea- "sure." This pleasure may be accounted for in various ways: first, from the weakness of the human mind, which in contemplating any object whatever, fixes on some one principal point; and then, from the design of Nature, who likewise, in all her works, presents to us one single point of conformity, or of discordancy, which is as it were it's centre. The mind increases it's affection, or it's aversion, for this characteristic trait, the more simple that it is, and in appearance contemptible. This is the reason that, in eloquence, the shortest expressions always convey the strongest passions; for all that is requisite, as we have hitherto seen, in order to excite a sensation of pleasure or of pain, is to determine a point of harmony or of discord, between two contraries: now, when these two contraries are opposites in nature, and are so besides in magnitude, and in weakness, their opposition redoubles, and consequently their effect.

The effect is farther heightened, if to this is joined, especially, the surprize of seeing striking occasions of hope or of fear produced by objects of apparently small importance; for every physical effect produces in Man a moral feeling. For example, I have seen many pictures, and read many descriptions of battles,

which attempted to inspire horror by representing an infinite variety of instruments of destruction, and a multitude of dying and dead persons, wounded in every possible manner. The less did I feel myself moved, the more I perceived the machinery employed to move me: one effect destroyed the other. But I have been greatly affected by reading, in *Plutarch*, the death of *Cleopatra*.

That great Painter of calamity represents the Queen of Egypt meditating, in the tomb of *Anthony*, on the means of eluding the triumph of *Augustus*. A peasant brings her, with permission of the guards on duty at the entrance of the tomb, a basket of figs. The moment that the clown has retired she hastens to uncover the basket, and perceives the aspic, which by her contrivance had been introduced among the figs, to put a period to her miserable life. This contrast, a woman being the subject, of liberty and slavery, of royal power and annihilation, of voluptuousness and death, those leaves and fruits amidst which she perceives only the head and sparkling eyes of a puny reptile, prepared to terminate interests of such "great pith and moment;" and which she thus addresses, *There you are!* all these oppositions, one after another make you shudder.

But in order to render the person itself of *Cleopatra* interesting, there is no occasion to represent her to yourself as our Painters and Sculptors exhibit her, an academic figure destitute of expression; a strapping virago, robust and replete with health, with large eyes turned toward Heaven, and wearing round her large and brawny arm a serpent twisted, like a bracelet.

let. This is by no means a representation of the little, voluptuous Queen of Egypt, who had herself carried, as I before mentioned, packed up in a bundle of goods, on the shoulders of *Apollodorus*, to keep a stolen assignation with *Julius Cæsar*, at another time walking the streets of Alexandria by night with *Anthony*, disguised as a sempstress, rallying him, and insisting that his jests and style of humour smelt strongly of the soldier. Still less is it a representation of the unfortunate *Cleopatra*, reduced to the extreme of calamity, dragging up by means of cords and chains, with the assistance of two of her women, through the window of the monument in which she had taken refuge, with her head downward, without ever letting go her hold says *Plutarch*, that very *Anthony*, covered over with blood, who had run himself through with his own sword, and who struggled with all his remaining strength to get up and expire in her arms.

Details are by no means to be despised, they are frequently traits of character. To return to our Painters and Sculptors; if they with-hold the expression of motion to landscapes, to wrestlers, and to chariots in the course, they bestow it on the portraits and the statues of our great Men and Philosophers. They represent them as Angels sounding the alarm to judgment, with hair flying about, with wild wandering eyes, the muscles of the face in a state of convulsion, and their garments fluttering in the wind. These, they tell us, are the expressions of genius. But persons of genius and great Men are not bedlamites. I have seen some of their portraits on an-

tiques. The medals of *Virgil*, of *Plato*, of *Scipio*, of *Epaminondas*, nay, of *Alexander*, represent them with a serene and tranquil air. It is the property of inanimate matter, of vegetables, and of mere animals, to obey all the movements of Nature; but it is that of a great Man, in my opinion, to have his emotions under command, and it is only in so far as he exercises this empire, that he merits the name of Great.

I have made a short digression from my subject, in order to suggest a few lessons of *conformity* to Artists, who I am well aware will find it much more difficult to execute than it is easy for me to criticise. God forbid that any thing I have said should give a moment's pain to men whose works have so frequently given me exquisite pleasure. It was simply my wish to caution the ingenious against the academic manner which fetters them, to stimulate them to tread in the steps of Nature, and to pursue that track as far as genius can carry them.

This would be the place to speak of Music, for sounds are movements merely: but persons of much greater ability than I dare pretend to, have treated this noble Art with consummate skill. If any foreign testimony could farther confirm me in the certainty of the principles which I have hitherto laid down, it is that of Musicians of the highest reputation, who have restricted harmonic expression to three sounds. I might, as they have done, reduce to three terms the elementary generations of colours, of forms, and of motions; but if I am not mistaken, they themselves have omitted, in their fundamental basis, the generative principle, which is sound properly so called, and the

the negative term, which is silence; especially as this last produces effects so powerful in the movements of Music.

These proportions might be extended to the progressions of tasting, and it might be demonstrated, that the most agreeable of them have similar generations; as we know by experience to be the case with regard to most fruits, whose different stages of maturity successively present five savours, namely, the acid, the sweet, the sugary, the vinous, and the bitter. They are acid while growing, sweet as they ripen, sugary in a state of perfect maturity, vinous in their fermentation, and bitter in a state of dryness. Farther, we should find the most agreeable of these savours, namely, the sugary, is that which occupies the middle place in this progression, of which it is the harmonic term; that from it's nature it forms new harmonies, by a combination with it's extremes; for the beverages which are most grateful to the palate, consist of acid and sugar, as the refreshing liquors prepared with citron-juice; or of sugar and bitter, such as coffee. But while I am endeavouring to open new paths to Philosophy, it is no part of my intention to present new combinations to voluptuousness.

Though I have a thorough conviction of the truth of these elementary generations, and am able to support them with a multitude of proofs which I have collected in the tastes of polished and of savage Nations, but which time permits me not at present to exhibit; it would however be a matter of no surprize to me, should many of my Readers dissent from what I have advanced. Our natural tastes are perverted

verted from our infancy by prejudices which determine our physical sensations, much more powerfully than these last give direction to our moral affections. More than one Churchman considers violet as the most beautiful of colours, because his Bishop wears it: more Bishops than one give scarlet the preference, because it is the Cardinal's colour; and more than one Cardinal undoubtedly would rather be dressed in white, because this colour is appropriated to the Head of the Church. A soldier frequently looks upon the red as the most beautiful of all ribbons; but his superior officer prefers the blue. Our temperaments, as well as our conditions, have an influence upon our opinions.

Gay people prefer lively colours to every other; persons of sensibility those which are delicate; the melancholy assume the dusky. Though I myself consider red as the most beautiful of colours, and the sphere as the most perfect of forms; and though I am bound more than any other man strenuously to adhere to this order, because it is that of my system, I prefer to the full red the carmine colour, which has a slight shade of violet; and to the sphere the oval, or elliptical form. It likewise appears to me, if I may venture to say so, that Nature has bestowed by way of preference both of these modifications on the rose, at least before it is completely expanded. Farther, I like violet flowers better than white, and still much better than such as are yellow. I prefer a branch of lilach in bloom to a pot of gilly-flower,*

* Dr. *Johnson* tells us that *Gilly-flower* is a corruption in orthography for *July flower*. With due respect to so great an Etymologist,

and a Chinese daisy, with it's disk of a smoky yellow, it's rumpled shaggy down, it's violet and grave petals, to the most flashy cluster of sun-flowers in the Luxemburg.

I am persuaded that I have these in common with many other persons, and that if we form a judgment of men from the colour of their clothes, by far the majority is rather serious than gay. I am likewise of opinion that Nature, for to her we must ever have recourse in order to be assured that we are right, gives most of her physical beauties a tendency to melancholy. The plaintive notes of the nightingale, the deep shades of the forest, the sober lustre of the Moon, inspire no gaity, nevertheless they interest us, and that very deeply. I feel much more emotion in contemplating the setting than the rising Sun. In general we are pleased with gay and sprightly beauties, but we are melted and touched only by those which are melancholy.

I shall endeavour in another place to unfold the causes of these moral affections. They stand in connection with laws more sublime than any physical laws: while these last amuse our senses, the others speak to the heart, and calmly admonish us that Man is ordained to a much higher destination.

It is very possible that I may be mistaken in the order of those generations, and may have transposed

logist, this I take to be a mistake. The flowering of the plant is by no means limited to the month of July. The English term is derived from the French word *Giroflier*, (the clove-plant); every one knows the striking analogy between the savour of that spice and the smell of the Gilly-flower.—H. H.

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their terms. But all that I from the beginning proposed, was to open some new paths into the Study of Nature. It is sufficient for my purpose that the effect of these generations is generally acknowledged. Men more enlightened will establish the filiations of them in a more luminous order. All that I have hitherto said on this subject, or hereafter may say, is reducible to this great Law: Every thing in Nature is formed of contraries: it is from their harmonies that the sentiment of pleasure results, and out of their oppositions issues the sentiment of pain.

This Law, as we shall see, extends also to morals. Every truth, the truths of fact excepted, is the result of two contrary ideas. From this it follows, that as often as we decompound a truth by dialectics, we divide it into the two ideas of which it is constituted; and if we confine ourselves to one of it's elementary ideas, as to a detached principle, and deduce consequences from it, we shall convert it into a source of endless disputation; for the other elementary idea will abundantly supply consequences diametrically opposite to the person who is disposed to pursue them; and these consequences are themselves susceptible of contradictory decompositions, which go on without end. The Schools are admirably adapted to instruct us how to manage this process; and thither are we sent to form our judgment. There are we taught to separate the most evident truths not only in two, but, as *Hudibras* says, into four. If, for example, some one of our Logicians, observing that cold had an influence on vegetation, should think proper to maintain that cold is the only cause of it,

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and that heat is even inimical to it, he would take care no doubt to quote the efflorescences and the vegetations of ice, the growth, the verdure, and the flowering of mosses in Winter; plants burnt up by the heat of the Sun in Summer, and many other effects relative to his thesis. But his antagonist, availing himself on his side of the influences of Spring, and of the ravages of Winter, would clearly demonstrate that heat alone gives life to the vegetable world. But the truth is, after all, that heat and cold combined form one of the principles of vegetation, not only in temperate climates, but to the very heart of the Torrid Zone.

It may confidently be affirmed, that all the disorders in both Physics and Morals, are neither more nor less than the clashing opposition of two contraries. If men would pay attention to this Law, there would be a speedy end put to most of their wranglings and mistakes; for it may be urged, that every thing being composed of contraries, whoever affirms a simple proposition is only half right, as the contrary proposition has equally an existence in nature.

There is perhaps in the World but one intellectual truth, pure, simple, and which does not admit of a contrary idea; namely, the existence of GOD. It is very remarkable, that those who have denied it, adduce no other proofs to support their negation, but the apparent disorders of Nature, the extreme principles of which alone they contemplated: so that they have not demonstrated that no God existed, but that He was not intelligent, or that He was not good. Their error accordingly proceeds from their ignorance of natural Laws. Besides, their arguments have

have been founded for the most part on the disorders of men, who exist in an order widely different from that of Nature, and who alone, of all beings endowed with perception, have been committed to their own direction.

As to the nature of GOD, I know that faith itself presents Him to us, as the harmonic principle by way of supreme excellence, not only with relation to all that surrounds Him, of which He is the Creator and Mover, but even in his essence divided into three persons. *Bossuet* has extended these harmonies of DEITY to Man, by tracing in the operations of the human Soul some consonancy to the Trinity, of which it is the image. These lofty speculations are, I acknowledge, infinitely above my reach. Nay I am filled with admiration to think that the DIVINITY should have permitted beings so weak, and so transitory as we are, to take so much as a glimpse of his omnipotence on this Earth; and that he should have veiled under combinations of matter the operations of his infinite Intelligence, in order to adapt it to our perception. A single act of his will was sufficient to call us into being; the slightest communication of his work is sufficient to illuminate our reason; but I have a thorough persuasion, that if the smallest ray of his divine essence were to communicate itself directly to us in a human body, we must be annihilated.

OF CONSONANCES.

Consonances are repetitions of the same harmonies. They increase our pleasures by multiplying them, and by transferring the enjoyment of them to new scenes.

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They farther communicate pleasure, by rendering it perceptible to us that the same intelligence has presided over the different plans of Nature, as it presents to us throughout, similar harmonies. Consonances accordingly confer more pleasure than simple harmonies, because they convey to us the sentiments of extension, and of Divinity, so congenial to the nature of the human Soul. Natural objects excite in us a certain degree of satisfaction, only in so far as they awaken and display an intellectual feeling.

We find frequent examples of consonances in Nature. The clouds of the Horizon frequently imitate, on the Sea, the forms of mountains and the aspects of land, and this so exactly as often to deceive the most experienced mariners. The waters reflect from their heaving bosom the heavens, the hills, the forests. The echoing rocks in their turn repeat the murmuring of the waters. As I was walking one day in the Païs de Caux along the sea-side, and considering the reflexes of the shore in the bosom of the water, I was not a little astonished to hear other waves emitting a dying sound behind me. I turned round, and perceived only a high and steep shore, the echoes of which were repeating the noise of the waves. This double consonance appeared to me wonderfully agreeable. You would have said there was a mountain in the sea, and a sea in the mountain.

Those transpositions of harmony from one element to another, communicate inexpressible pleasure. Nature has multiplied them accordingly, with boundless liberality, not only in fugitive images but by permanent forms. She has repeated, in the midst of the Seas,

Seas, the forms of Continents in those of Islands; most of which, as we have seen, have peaks, mountains, lakes, rivers, and plains, proportioned to their extent, as if they were little Worlds. On the other hand, she represents in the midst of the Land the basons of the vast Ocean, in mediterraneans and in great lakes, which have their shores, their rocks, their isles, their volcanos, their currents, and sometimes a flux and reflux peculiar to themselves, and which is occasioned by the effusions from icy mountains, at the basis of which they are commonly situated, as the currents and tides of the Ocean are by those of the Poles.

It is singularly remarkable that the most beautiful harmonies are those which have the most consonances. Nothing in the World, for example, is more beautiful than the Sun, and nothing in nature is so frequently repeated as his form and his light. He is reflected in a thousand different manners by the refractions of the air, which every day exhibit him above all the horizons of the Globe, before he is actually risen, and for some time after he is set; by the parhelia which reflect his disk, sometimes twice or thrice in the misty clouds of the North; by the rainy clouds, in which his refracted rays trace an arch shaded with a thousand various colours; and by the water, whose reflexes exhibit him in an infinite number of places where he is not, in the bosom of meadows, amidst flowers besprinkled with dew, and in the shade of green forests. The dull and inert earth too reflects him in the specular particles of gravels, of micas, of crystals, and of rocks. It presents to us

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the form of his disk and of his rays, in the disks and petals of the pyramids of radiated flowers with which it is covered. In a word, this beautiful star has multiplied himself to infinity with varieties of which we know nothing, in the innumerable stars of the firmament which he discovers to us as soon as he quits our Horizon; as if he had withdrawn himself from the consonances of the earth only to display to the delighted eye those of Heaven.

From this Law of consonance it follows, that what is best and most beautiful in Nature is likewise most common and the most frequently repeated. To it we must ascribe the varieties of species in each genus, which are so much the more numerous in proportion as that genus is useful. For example, there is no family in the vegetable kingdom so necessary as that of the gramineous, on which subsist not only all the quadrupeds, but endless tribes of birds and insects; and there is no one accordingly whose species are so varied. We shall take notice in the Study on Plants, of the reasons of this variety. I shall only remark in this place, that it is in the gramineous families Man has found the great diversity of nutritious grains from which he derives his chief subsistence; and that from reasons of consonance not only the species but several of the genera nearly approach to each other, in order that they may present similar services to Man under Latitudes entirely different. Thus the millet of Africa, the maize of Brasil, the rice of Asia, the palm-sago of the Moluccas, the trunks of which are filled with alimentary flour, are in consonance with

the corns of Europe. We shall find consonances of another kind in the same places, as if it had been the intention of Nature to multiply her benefits by varying only the form of them, without changing almost any thing of their qualities. Thus in our gardens, what a delightful and beneficial consonancy there is between the orange and citron trees, the apple and the pear, the walnut and the filbert; and in our farm-yards, between the horse and the ass, the goose and the duck, the cow and the she-goat.

Farther, each genus is in consonancy with itself, from difference of sex. There are however between the sexes contrasts which give the greatest energy to their loves, from the very opposition of contraries, from which as we have seen, all harmony takes it's birth: but without the general consonancy of form which is between them, sensible beings of the same genus never would have approached each other. Without this, one sex would have for ever remained a stranger to the other. Before each of them could have observed what the other possessed that corresponded to it's necessities, the time of reflection would have absorbed that of love, and perhaps have extinguished all desire. It is consonancy which attracts and contrast which unites them. I do not believe that there is in any one genus an animal of one sex entirely different from one of the other, in exterior forms; and if such differences are actually found, as certain Naturalists pretend, in several species of fishes and insects, I am fully persuaded that Nature placed the habitation of the male and of the female very close

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to each other, and planted their nuptial couch at no great distance from their cradle.

But there is a consonancy of forms much more intimate still than even that of the two sexes, I mean the duplicity of the organs which exists in each individual. Every animal is double. If you consider his two eyes, his two nostrils, his two ears, the number of his legs and arms disposed by pairs, you would be tempted to say, here are two animals glued the one to the other, and united under the same skin. Nay the parts of his body which are single, as the head, the tail, and the tongue, appear to be formed of two halves, compacted together by seams. This is not the case with regard to the members properly so called: for example, one hand, one ear, one eye, cannot be divided into two similar halves; but the duplicity of form in the parts of the body distinguishes them essentially from the members: for the part of the body is double, and the member is single: the former is always single and alone, and the latter always repeated. Thus the head and the tail of an animal are parts of it's body, and the legs and ears of it are members.

This Law of Nature, one of the most wonderful and one of the least observed, destroys at one blow all the hypotheses which introduce chance into the organization of beings; for, independently of the harmonies which it presents, it doubles at once the proofs of a Providence, which did not deem it sufficient to give one principal organ to each animal, adapted to each element in particular, such as the eye for the light of the Sun, the ear for the sounds of the

air, the foot for the ground which is to support it; but determined, besides, that every animal should have each of those organs by pairs.

Certain Sages have considered this admirable duplication as a pre-disposition of Providence, in order that the animal might have a substitute always at hand to supply the loss of one of the double organs, exposed as they are to so many accidents; but it is remarkable that the interior parts of the body, which at first sight appear to be single, present on closer examination a similar duplicity of forms, even in the human body, where they are more confounded than in other animals. Thus the five lobes of the lungs, one of which has a kind of division; the fissure of the liver; the supernal separation of the brain, by the reduplication of the *dura-mater;* the *septum lucidum*, similar to a leaf of talc, which separates the two anterior ventricles of it; the two ventricles of the heart; and the divisions of the other *viscera* announce this double union, and seem to indicate that *the very principle of life is the consonance of two similar harmonies.**

* Each organ is itself in opposition with the element for which it is destined; so that from their mutual opposition arises a harmony which constitutes the pleasure enjoyed by that organ. This is very remarkable, and confirms the principles which we have laid down. Thus the organ of vision adapted principally to the Sun, is a body singularly opposite to him, in that it is almost entirely aqueous. The Sun emits luminous rays; the eye, on the contrary, is surrounded by a dusky eye-brow, which overshadows it. The eye is, besides, veiled with a lid which can be raised and dropped at pleasure; and it farther opposes to the whiteness of the light a tunic entirely black, called the *uvea*, which clothes the extremity of the optic nerve.

The other parts of the body present, in like manner, oppositions to

There farther results from the duplicity of organs, a much more extensive range of utility than if they had been single. Man by the assistance of two eyes can take in at once more than half of the Horizon; with a single one he could scarcely have embraced a third part. Provided with two arms he can perform an infinite number of actions which he never could have accomplished with one only; such as raising upon his head a load of considerable size and weight, and clambering up a tree. Had he been placed upon one leg, not only would his position be much more unsteady than upon two, but he would be unable to walk; his progressive motion would be reduced to crawling or hopping. This method of advancing would be entirely discordant to the constitution of the other parts of his body and to the variety of soils, over which he is destined to move.

If Nature has given a single exterior organ to animals, such as the tail, it is because the use of it being extremely limited extends but to a single action to which it is fully equivalent. Besides, the tail, from it's situation is secured against almost every danger. Farther, hardly any but the very powerful animals have a long tail, as bulls, horses, and lions. Rabbits

to the action of the elements to which they are adapted. Accordingly the feet of animals which scramble among rocks are provided with pincers, as those of tigers and lions. Animals which inh bit cold countries are clothed with warm furs, and so on. But with all this, we must not always reckon on finding these contraries of the same species in every animal. Nature possesses an infinite variety of means for producing the same effects, conformably to the necessities of every individual.

and hares have it very short. In feeble animals, which have one of considerable length as the thornback, it is armed with prickles, or else it grows again if it happens to be torn off by an accident, as in the case of the lizard. Finally, whatever may be the simplicity of it's use, this is remarkable, it is formed of two similar halves, as the other parts of the body,

There are other interior consonances, which collect diagonally, if I may use the expression, the different organs of the body, in order to form but one only and single animal of it's two halves. I leave to Anatomists the investigation of this incomprehensible connection: but be their knowledge ever so extensive, I much doubt whether they will ever be able to trace the windings of this labyrinth. Why, for instance, should the pain which attacks a foot make itself felt sometimes in the opposite part of the head, and *vice versa?* I have seen a very astonishing proof of this consonance in the case of a serjeant who is still living, I believe in the Hospital of Invalids. This man having a fencing bout one day with a comrade, who as well as himself made use of his undrawn sword, received a thrust in the lachrymal angle of the left eye, which immediately deprived him of his senses. On coming to himself, which did not happen till several hours afterward, he was found to be completely paralytic in his right leg and right arm, and no medical assistance has ever been able to restore the use of them.*

* This soldier was of Franche-Compté. I never saw him but once, and I have forgotton his name as well as that of the regiment to which he belonged; but I have not lost the recollection of

I must here observe, that the cruel experiments every day made on brutes, in the view of discovering these secret correspondencies of Nature, serve only to spread a thicker veil over them; for their muscles, contracted by terror and pain, derange the course of the animal spirits, accelerate the velocity of the blood, put the nerves into a state of convulsion, and tend much rather to unhinge the animal economy, than to unfold it. These barbarous means, employed by our modern Physics, have an influence still more fatal on the morals of those who practise them; for, together with false information, they inspire them with the most atrocious of all vices, which is cruelty.

If Man may presume to put questions to Nature respecting the operations which she is pleased to conceal, I should prefer the road of pleasure to that of pain. Of the propriety of this sentiment I was witness to an instance, at a country-seat in Normandy. Walking in one of the adjoining fields with a young gentleman who was the proprietor of them, we perceived bulls a fighting; he ran up to them; with his staff brandished, and the poor animals instantly

of his virtuous conduct, which was reported to me on undoubted authority. When the accident above related sent him to the Invalids, he remembered that in his capacity of serjeant, he had inveigled, at the instigation of his captain, in a country village, a young fellow to enlist who was the only son of a poor widow, and who was killed three months afterward in an engagement. The serjeant recollecting this act of cruelty and injustice, formed the resolution of abstaining from wine. He sold his allowance as a pensioner in the Hospital of the Invalids, and remitted the amount every six months to the mother whom he had robbed of her son.

gave up their contention. He presently went up to the most ferocious of the tribe and began to tickle him with his fingers at the root of the tail. The animal, whose eyes were still inflamed with rage, became motionless, with outstretched neck, expanded nostrils, transpiring the air with a satisfaction which most amusingly demonstrated the intimate correspondence between this extremity of his body and his head.

The duplicity of organs is farther observable even in vegetables, especially in their essential parts, such as the *antheræ* of the flowers, which are double bodies; in their petals, one half of which corresponds exactly to the other, in the lobes of their seed, &c. A single one of these parts however appears to me sufficient for the expansion and the generation of the plant. This observation might be extended to the very leaves, the two halves of which are correspondent in most vegetables; and if any one of them recedes from this order, it is undoubtedly for some particular reason, well worthy of investigation.

These facts confirm the distinction which we have made between the parts and the members of a body; for in the leaves where their duplicity occurs the vegetative faculty is usually to be found, which is diffused over the body of the vegetable itself. So that if you carefully replant those leaves, and at the proper season, you will see the complete vegetable thence reproduced: Perhaps it is because the interior organs of the tree are double that the principle of vegetative life is diffused even over it's slips, as we see it in a great number which sprout again from one branch.

Nay

Nay there are some which have the power of perpetuating themselves by cuttings simply. Of this we have a noted instance in the memoirs of the Academy of Sciences. Two sisters on the death of their mother became heiresses of an orange-tree. Each of them insisted on having it thrown into her allotment. At length after much wrangling, and neither of them being disposed to resign her claim, it was settled that the tree should be cleft in two, and each take her half. The orange-tree accordingly underwent the judgment pronounced by *Solomon* on the child. It was cleft asunder; each of the sisters replanted her own half, and, wonderful to be told! the tree which had been separated by unsisterly animosity received a new clothing of bark from the benignant hand of Nature.

It is this universal consonance of forms which has suggested to Man the idea of symmetry. He has introduced it into most of his works of art, and particularly into Architecture as an essential part of order. To such a degree in fact is it the work of intelligence and of combination, that I consider it as the principal character by which we are enabled to distinguish all organized bodies from such as are not so, and are only results of a fortuitous aggregation, however regular their assemblage may appear; such as those which produce crystallizations, efflorescences, chemical vegetations, and igneous effusions.

It was in conformity to these reflections that, on considering the Globe of the Earth, I observed with the greatest surprize, that it too presented, like every organized body, a duplicity of form. From the beginning

ginning it had been my thought that this Globe being the production of an Intelligence, order must of necessity pervade it. I had discerned and admired the utility of islands, and even of that of banks, of shelves, and of rocks, to protect the parts of the Continents which are most exposed to the Currents of the Ocean, at the extremities of which they are always situated. I had in like manner discerned the utility of bays, which are, on the contrary, removed from the Currents of the Ocean, and hollowed into deep retreats to shelter the discharge of rivers, and to serve by the tranquillity of their waters as an asylum to the fishes, which in all seas retire thither in shoals, to collect the spoils of vegetation, and the alluvions of the Land, there disgorged by the rivers. I had admired in detail the proportions of their different fabrics, but had formed no conception of their combination. My mind was bewildered amidst such a multiplicity of cuttings and carvings, of land and sea; and I should without hesitation, have ascribed the whole to chance, had not the order which I perceived in each of the parts suggested to me the possibility that there might exist order also in the totality of the Work.

I am now going to display the Globe under a new aspect. The Reader will, I hope, forgive this digression, which exhibits to him one little fragment of the materials I had laid up for a geographical structure, but which tends to prove the universality of the natural Laws whose existence I am endeavouring to establish. I shall be as usual rapid and superficial: but it is a matter of very inferior importance to my-

self, should I enfeeble ideas which I have not been permitted to arrange in their natural order, provided I am enabled to transmit the germ of them into a head superior to my own.

I first endeavoured to find out consonances between the northern and southern halves of the Globe. But so far from discovering resemblances between them, I perceived nothing but oppositions; the northern being, if I may so express myself, a terrestrial Hemisphere only, and the southern a maritime: and so different from each other, that the Winter of the one is the Summer of the other, and that the seas of the first Hemisphere seem to be opposed to the lands and to the islands which are scattered over the second. This contrast presented to me another analogy with an organized body: for, as we shall see in the following articles, every organized body has two halves in contrast, as there are two in consonance.

I found in it then, under this new aspect, something like analogy with an animal, the head of which should have been to the North, from the attraction of the magnet peculiar to our Pole, which seems there to fix a sensorium, as in the head of an animal: the heart under the Line, from the constant heat which prevails in the Torrid Zone, and which seems to determine this as the region of the heart; finally, the excretory organs in the southern part, in which the greatest Seas, the vast receptacles of the alluvions of Continents, are situated; and where we likewise find the greatest number of volcanos, which may be considered as the excretory organs of the Seas, whose bitumens and sulphurs they are incessantly consuming.

Besides,

Besides, the Sun, who sojourns five or six days longer in the Northern Hemisphere, seemed to present to me a farther and a more marked resemblance to the body of an animal, in which the heart, the centre of heat, is somewhat nearer to the head than to the lower extremities.

Though these contrasts appeared to me sufficiently determinate to manifest an order on the Globe, and though I perceived something similar in vegetables, distinguished as they are into two parts, opposite in functions and in forms, such as the leaves and the roots; I was afraid of giving scope to my imagination, and of attempting to generalize, through the weakness of the human mind, the Laws of Nature peculiar to each existence, by extending them to kingdoms, which were not susceptible of the application.

But I ceased to doubt of the general order of the Globe, when, with two halves in contrast, I found two others in consonance. I was struck with astonishment, I must confess, when I observed in the duplicity of forms which constitute it, members exactly repeated on that side and on this.

The Globe, if we consider it from East to West, is divided, as all organized bodies are, into two similar halves, which are the Old and the New World. Each of their parts mutually corresponds in the eastern and western Hemisphere; sea to sea, island to island, cape to cape, peninsula to peninsula. The lakes of Finland and the Gulph of Archangel, correspond to the lakes of Canada and Baffin's-bay; Nova Zembla to Greenland; the Baltic to Hudson's-bay; the

the Islands of Great Britain and Ireland, which cover the first of these mediterraneans, to the Islands of Good-Fortune and Welcome, which protect the second: the Mediterranean, properly so called, to the Gulf of Mexico, which is a kind of mediterranean formed in part by islands. At the extremity of the Mediterranean we find the isthmus of Suez in consonance with the isthmus of Panama, placed at the bottom of the Gulf of Mexico. Conjoined by those isthmuses, the peninsula of Africa presents itself in the Old World, and the peninsula of South-America in the New. The principal rivers of these divisions of the Globe front each other in like manner; for the Senegal discharges itself into the Atlantic, directly opposite to the river of the Amazons. Finally, each of these peninsulas, advancing toward the South Pole, terminates in a cape equally noted for violent tempests, the Cape of Good-Hope and Cape Horn.

There are besides between these two Hemispheres a variety of other points of consonance, on which I shall no longer insist. These different particulars, it is admitted, do not correspond exactly in the same Latitudes; but they are disposed in the direction of a spiral line, winding from East to West, and extending from North to South, so that these corresponding points proceed in a regular progression. They are nearly of the same height, setting out from the North, as the Baltic and Hudson's-bay; and they lengthen in America in proportion as it advances toward the South. This progression makes itself farther perceptible along the whole length of the Old Continent, as may be seen from the form of it's Capes, which, taking

taking the point of departure from the East, lengthen so much the more toward the South as they advance toward the West; such as the Cape of Kamtschatka in Asia; Cape Comorin in Arabia; the Cape of Good-Hope in Africa; and finally, Cape Horn in America.

These differences of proportion are to be accounted for from this, that the two terrestrial Hemispheres are not projected in the same manner; for the Old Continent has it's greatest breadth from East to West, and the New has it's greater extent from North to South; and it is manifest that this difference of projection has been regulated by the AUTHOR of Nature, for the same reasons which induced him to bestow double parts on animals, in order that, if necessity required, the one might supply what was deficient in the other, but principally that they might be of mutual assistance.

If, for example, there existed only the Ancient Continent, with the South-Sea alone, the motion of that Sea being too much accelerated under the Line by the regular winds from the East, would, after having surrounded the Torrid Zone, advance with incredible fury, and attack tremendously the land of Japan: for the size of the billows of a Sea is always in proportion to it's extent. But from the disposition of the two Continents, the billows of the great eastern Current of the Indian Ocean are partly retarded by the archipelagos of the Moluccas and Philippine Islands; they are still further broken by other islands, such as the Maldivia, by the Capes of Arabia, and by that of Good-Hope, which throws them back toward the South. Before they reach Cape-Horn

Horn they have to encounter new obstacles from the Current of the South Pole, which then crosses their course, and the change of the monsoon, which totally destroys the cause of the commotion at the end of six months. Thus there is not a single Current, be it easterly or northerly, which pervades so much as a quarter of the Globe in the same direction. Besides, the division of the parts of the Globe into two is so necessary to it's general harmony, that if the channel of the Atlantic Ocean, which separates them, had no existence, or were in part filled up, according to a supposition once entertained, by the great island Atlantis,* all the oriental rivers of America, and all the occidental of Europe would be dried up; for those rivers owe their supplies only to the clouds which emanate from the sea. Besides, the sun enlightening on our side only one terrestrial Hemisphere, the mediterraneans of which would disappear, must burn it up with his rays; and at the same time, as he warmed on the other side a Hemisphere of water only, most of the islands of which would sink of course, because the quantity of that Sea must be increased by the subtraction of ours, an immensity of vapour would arise and go merely to waste.

It would appear that, from these considerations, Nature has not placed in the Torrid Zone the greatest length of the Continents, but only the mean breadth of America and of Africa, because the action of the

* A fabulous island imagined by *Plato*, as has been demonstrated by many learned men, allegorically to represent the Athenian Government.

Sun

Sun would there have been too vehement. She has placed there, on the contrary, the longest diameter of the South-Sea, and the greatest breadth of the Atlantic Ocean, and there she has collected the greatest quantity of islands in existence. Farther, she has placed in the breadth of the Continents which she has there lengthened out, the greatest bodies of running water that are in the World, all issuing from mountains of ice; such as the Senegal and the Nile, which issue from the mountains of the Moon in Africa; the Amazon and the Oroonoko, which have their sources in the Cordeliers of America.

Again, it is for this reason that she has multiplied, in the Torrid Zone and it's vicinity, lofty chains of mountains covered with snow, and that she directs thither the winds of the North Pole and of the South Pole, of which the Trade-winds always partake. And it is very remarkable, that several of the great rivers which flow there are not situated precisely under the Line, but in regions of the Torrid Zone, which are hotter than the Line itself. Thus the Senegal rolls it's stream in the vicinity of Zara, or the Desert, which, if we may credit the concurring testimony of all travellers, is the hottest part of Africa.

From all this taken together, we have a glimpse of the necessity of two Continents, to serve mutually as a check to the movements of the Ocean. It is impossible to conceive how Nature could have disposed them otherwise, than by extending one of them lengthways and the other in breadth, in order that the opposed Currents of their Ocean might balance each

each other, and that there might thence result a harmony adapted to their shores and to the islands contained in their basons.

Were we to suppose these two Continents projected circularly from East to West, under the two temperate Zones, the circulation of the Sea contained between the two would be, as we have seen, too violently accelerated by the constant action of the East-wind. There could be no longer any communication by Sea from the Line toward the Poles; consequently no icy effusions in that Ocean, no tides, no cooling, and no renovation of it's waters. If we suppose, on the contrary, both Continents extended from North to South as America is, there would be no longer any oriental Current in the Ocean; the two halves of each Sea would meet in the midst of their channel, and their polar effusions would there encounter each other with an impetuosity of commotion, of which the icy effusions precipitated from the Alps, with all the dreadful ravages which they commit, convey but a faint idea. But by the alternate and opposite Currents of the Seas the icy effusions of our Pole proceed in Summer to cool Africa, Brasil, and the southern parts of Asia, forcing it's way beyond the Cape of Good-Hope, by the Monsoon which then carries the Current of the Ocean toward the East; and during our Winter the effusions of the South-Pole proceed toward the West, to moderate on the same shores the action of the Sun, which is there unremitting. By means of these two spiral motions of the Seas, similar to those of the Sun in the Heavens, there is not a single drop of water but what

may make the tour of the Globe, by evaporation under the Line, dissolution into rain in the Continent, and congelation under the Pole. These universal correspondencies are so much the more worthy of being remarked, that they enter into all the plans of Nature, and present themselves in the rest of her Works.

From any other imaginable order would result other inconveniences, which I leave the Reader to find out. Hypotheses *ex absurdo* are at once amusing and useful; they change, it is true, natural proportions into caricatures; but they have this advantage, that by convincing us of the weakness of our understanding, they impress us with a deep sense of the wisdom of Nature. Let us recollect the Socratic method of ratiocination. Do not let us waste our time in overturning systems which present to us plans different from those we see. Let us only deduce consequences from them: to admit them is complete refutation.

I could farther demonstrate, that most islands themselves consist of double parts, as the Continents of which, as I have elsewhere said, they are abridgments from their peaks, their mountains, their lakes, and their rivers proportioned to their extent. Many of those which are situated in the Indian Ocean have, if I may so express myself, two Hemispheres, the one oriental, the other occidental, divided by mountains which go from North to South, so that when it is Winter on one side Summer reigns on the other, and reciprocally; such are the islands of Java, Sumatra, Borneo, and most of the Philippines and Moluccas;

Moluccas ; so that they are evidently constructed for the two Monsoons of the Ocean in which they are placed.

Did time permit, the varieties of their construction would furnish me with many curious remarks, tending to confirm in particular what I have said in general respecting the consonances of the Globe. For my own part I believe these principles of order to be so certain, that I am persuaded it might be possible, on seeing the plan of an island, with the elevation and the direction of it's mountains, to ascertain it's longitude, it's latitude, and what are the winds which most regularly blow there. Nay, I farther believe, that with these last given, we might, *vice versâ*, trace the plan and shape of an island, situated in whatever part of the Ocean. From this however I except fluviatic islands, and such as being too small of themselves are collected into archipelagos, as the Maldivias ; because such islands have not the centre of all their adaptations in themselves, but are subordinated to the adjoining rivers, archipelagos, and continents.

It is indubitably certain that I advance no paradox, when I compare between the Tropics the general form of the islands which are exposed to the two Monsoons, and that of the islands which are under the regular East wind. We have just observed, that Nature had given in a certain sense two Hemispheres to the first, in dividing them through the middle by a chain of mountains running North and South, in order that they might receive the alternate influences of the East and West winds, which blow there by

turns six months of the year ; but in the islands situated in the South-Sea and the Atlantic Ocean, where the East wind blows incessantly from the same quarter, she has placed the mountains at the extremity of the Land, in the part most remote from the wind, that the brooks and rivers formed from the clouds, which are accumulated by that wind on their peaks, may flow through the whole extent of their isles.

I am sensible that I have elsewhere related these last observations, but I here present them in a new light. Besides, should I sometimes fall into a repetition, there can be no great harm in repeating new truths, and some indulgence is due to the weakness of him who announces them.

OF PROGRESSION.

Progression is a series of consonances ascending or descending. Wherever we meet progression, it produces exquisite pleasure, because it excites in our soul the sentiment of infinity so conformable to our nature. I have already said, and it cannot be repeated too frequently : Physical sensations delight us only in so far as they awaken an intellectual and moral sentiment.

When the leaves of a vegetable are arranged round it's branches, in the same order that the branches themselves are round the stem, there is consonancy as in pines ; but if the branches of that vegetable are farther disposed among themselves on similar plans, which go on diminishing in magnitude, as in the pyramidical form of firs, there is progression ; and if these trees are themselves disposed in long avenues,

decreasing

decreasing in height and in colouring, like their particular mass, our pleasure is heightened, because the progression becomes infinite.

From this instinct of infinity it is that we take pleasure in viewing every object which presents us with a progression; as nursery-grounds containing plants of different ages, hills flying off to the Horizon in successive elevations, perspectives without a termination.

Montesquieu has nevertheless remarked, that if the road from Petersburg to Moscow is in a straight line, the traveller must die upon it with languor. I have performed that journey, and can confidently affirm from personal knowledge, that the road is very far from being in a straight line. But admitting it to be so, the languor of the traveller would arise from the very sentiment of infinity joined to the idea of fatigue. It is this same sentiment, so delicious when it blends with our pleasures, which overwhelms us with anguish unutterable when connected with calamity; as we but too frequently experience. However, I believe that we should sink at length under the weight of an unbounded perspective, from it's presenting infinity to us always in the same manner; for our soul has not only the instinct of it, but likewise that of universality, that is of every possible modification of infinity.

Nature has not formed after our limited manner perspectives with one or two consonances; but she composes them of a multitude of different progressions, by introducing that of plans, magnitudes, forms, colours, movements, ages, kinds, groups, seasons, la-

titudes, and combining with these an infinity of consonances, deduced from reflexes of light, of waters, of sounds.

Let me suppose that she had been limited to the plantation of an avenue from Paris to Madrid, with one single genus of trees, say the fig; I do not apprehend I should tire on performing that journey. I should see upon it one species of the fig-tree bearing the fruit called by the Latins *mamillanæ**, because it had a resemblance to a woman's breast, in Latin *mamilla:* another species with figs quite red and not bigger than an olive, such as those of Mount Ida; another with white fruit; with black; of the colour of porphyry, and thence called by the Ancients *porphyritæ*. In the course of this track would likewise occur the fig-tree of Hyrcania, loaded with more than two hundred bushels of fruit; the ruminal fig-tree, the species under the shade of which *Romulus* and *Remus* were suckled by a she-wolf; the fig-tree of *Hercules*; in a word the nineteen species enumerated by *Pliny*, and a great variety of others unknown to the Romans and to us. Each of these species of trees would exhibit vegetables of various magnitude; young, old, solitary, in clusters; some planted by the brink of rivulets, some issuing from the clefts of rocks. Each tree would present the same variety in it's fruits; exposed on one single foot, if I may use the expression, to different Latitudes, to the South, to the North, to the East, to the West, to the Sun, and under the shade of the leaves: some of them would be green and just beginning to shoot, others violet

* See *Pliny's* Natural History, book xv. chap. 18.

and

and cracked, their crevices stored with honey. On the other hand we should find some under different Latitudes, in the same degree of maturity as if they hung upon the same tree, those which grow to the North being in the bottom of valleys, sometimes as forward as those which, though much farther to the South, ripen more slowly from their situation on the tops of mountains.

These progressions are to be found in the minutest of the works of Nature and of which they constitute the principal charm. They are not the effect of any mechanical Law. They have been apportioned to each vegetable, for the purpose of prolonging the enjoyment of it's fruit conformably to the wants of Man. Thus the aqueous and cooling fruits, such as those of a ruddy hue, appear only during the season of heat; others, which were necessary in the Winter time, from their nutrimental flours and their oils; as chestnuts and walnuts, are capable of being preserved a considerable part of the year. But those which are designed to supply the accidental demands of Mankind, those of travellers and navigators for instance, remain on the earth at all times. Not only are these last inclosed in shells adapted to their preservation, but they appear upon the tree at all seasons and in every degree of maturity. In tropical countries on the uninhabited shores of the islands,* the cocoa-tree bears at once twelve or fifteen clusters of cocoa-nuts, some of which are still in the bud; others are in flower; others are knit; others are already full

* See *Francis Pyrard's* Voyage to the Maldivias.

of milk; and finally some are in a state of perfect maturity. The cocoa is the seaman's tree.

It is not the heat of the Tropics which gives to this tree a fecundity so constant and so varied; for the fruit of the trees have, in the Indies as in our climates, seasons of ripening, after which they are seen no more till the season returns. I know of no other, except the cocoa-tree and the banana, which are in fruit all the year round. The last mentioned plant is in my opinion the most useful in the World, because it's fruit makes excellent food without any art of cookery, having a most agreeable flavour and possessing very nutrimental qualities. It produces a cluster or aggregation of sixty or four-score fruit, which come to maturity all at once; but it pushes out shoots of every degree of magnitude which bear in succession and at all times. The progression of fruits in the cocoa is in the tree, and that of the fruits of the banana is in the plantation. Universally that which is most useful is likewise most common.

The productions of our corn-fields and vineyards present dispositions still more wonderful; for though the ear of corn has several faces, it's grains come to maturity at the same time from the mobility of it's straw, which presents them to all the aspects of the Sun. The wind does not grow in form of a bush nor of a tree, but in hedge-rows; and though it's berries be arranged in form of clusters, their transparency renders them throughout penetrable by the rays of the Sun. Nature thus lays men under the necessity, from the spontaneous maturity of these fruits, destined to the general support of human life, to unite their labours,

labours, and mutually assist each other in the pleasant toils of the harvest and the vintage. The corn-field and the vineyard may be considered as the most powerful cements of society. *Bacchus* and *Ceres* accordingly were regarded in ancient times as the first Legislators of the Human race. The Poets of antiquity frequently distinguish them by this honourable appellation. An Indian under his banana and his cocoa-tree can do extremely well without his neighbour. It is for this reason, I believe, rather than from the nature of the climate, which is there so mild, that there are so few republics in India and so many governments founded in force. One man can there make an impression on the field of another only by the ravages which he commits: but the European who sees his harvest grow yellow, and his grapes blacken all at once, hastens to summon to his assistance in reaping his crop, not only his neighbours, but the traveller who happens to be passing that way. Besides, Nature, while she has refused to the corn-plant and the vine the power of yielding their fruits at all seasons of the year, has bestowed on the flour of the one, and on the wine of the other, the quality of being preservable for ages.

All the Laws of Nature have a respect to our necessities; not only those which are evidently contrived to minister to our comfort, but others frequently concur to this end, so much the better the more that they seem to deviate from it.

OF CONTRASTS.

Contrasts differ from contraries in this, that contraries act but in one single point, and contrasts in their general combination. An object has but one contrary, but it may have many contrasts. White is the contrary of black; but it contrasts with blue, green, red, and various other colours.

Nature, in order to distinguish the harmonies, the consonances, and the progressions of bodies from each other, makes them exhibit contrasts. This Law is so much the less observed the more common it is. We trample under foot truths the most wonderful and of the highest importance, without paying the slightest attention to them.

All Naturalists consider the colour of bodies as simple accidents; and most of them look on their very forms as the effect of some attraction, incubation, crystallization, &c. Books are every day composed, the object of which is to extend by analogies the mechanical effects of those Laws to the different productions of Nature; but if they really possess so much power, how comes it that the Sun, that universal agent, has not long ere now filled the waters, the dry land, the forests, the heavens, the plains, and all the creatures over which he exercises so much influence, with the uniform and monotonous effects of his light? All these objects ought to assume his appearance, and present only white or yellow to our eyes, and be distinguished from each other only by their shades. A landscape ought to exhibit to us no other effects but those of a cameo, or of a print.

Lati-

Latitudes we are told diversify the colour of them. But if Latitudes have this power, how comes it to pass that the productions of the same climate and of the same field have not all the same tints? Whence is it that the quadrupeds which are born and die in the meadow, do not produce young ones green as the grass on which they feed?

Nature has not satisfied herself with establishing particular harmonies in every species of beings in order to characterize them; but that they might not be confounded among themselves she exhibits them in contrasts. We shall see in the following Study, for what particular reason she has bestowed upon herbs a green hue in preference to every other colour. In general she has made herbs green to detach them from the earth; and then she has given the colour of the earth to animals which live on herbage to distinguish them in their turn from the ground over which they stray. This general contrast may be remarked in the herbivorous quadrupeds, such as the domestic animals, the yellow beasts of the forests, and in all the granivorous birds which live among herbage, or in the foilage of trees, as the hen, the partridge, the quail, the lark, the sparrow, and many others which are of earthly colours, because they live among verdure. But those, on the contrary, who live on dingy grounds are clad in brilliant colours as the bluish tom-tit and the woodpecker, which scramble along the rind of trees in pursuit of insects, and many others.

Nature universally opposes the colour of the animal to that of the ground on which it is destined to live,

live. This most admirable Law admits not of a single exception. I shall here produce a few examples of it, to put my Reader in the way of observing those delightful harmonies, of which he will find abundant proofs in every climate. There is seen, on the shores of India, a large and beautiful bird, white and fire-coloured, called the *flamingo*, not that it is of *Flemish* extraction, but the name is derived from the old French word *flambant* (flaming) because it appears at a distance like a flame of fire. He generally inhabits in swampy grounds and salt marshes, in the waters of which he constructs his nest, by raising out of the moisture, of a foot deep, a little hillock of mud a foot and a half high. He makes a hole in the summit of this little hillock; in this the hen, deposits two eggs, and hatches them with her feet sunk in the water, by means of the extreme length of her legs. When several of these birds are sitting at the same time on their eggs, in the midst of a swamp, you would take them at a distance for the flames of a conflagration bursting from the bosom of the waters.

Other fowls present contrasts of a different kind on the same shores. The pelican, or wide throat, is a bird white and brown, provided with a large bag under it's beak, which is of excessive length. Out he goes every morning to store his bag with fish: and the supply of the day having been accomplished, he perches on some pointed rock on a level with the water, where he stands immovable till the evening, says Father *Du Tertre*,* "as in a state of profound "sorrow, with the head drooping, from the weight

* History of Antilles.

"of

" of his long bill, and eyes fixed on the agitated " Ocean, as motionless as a statue of marble." On the dusky strand of those seas may frequently be distinguished herons white as snow, and in the azure plains of the sky the paillençu of a silvery white, skimming through it almost out of sight: he is sometimes glazed over with a bright red, having likewise the two long feathers of his tail the colour of fire, as that of the South-Seas.

In many cases, the deeper that the ground is the more brilliant are the colours in which the animal destined to live upon it is arrayed. We have not perhaps in Europe any insect with richer and gayer clothing than the stercoraceous scarab, and the fly which bears the same epithet. This last is brighter than burnished gold and steel; the other of a hemispherical form, is of a fine blue, incling to purple: and in order to render the contrast complete, he exhales a strong and agreeable odour of musk.

Nature seems sometimes to deviate from this Law, but then it is from other reasons of conformity, according to which all her plans are adjusted. Thus, after having contrasted with the ground on which they live, the animals capable of making their escape from every danger by their strength, or their agility, she has confounded those whose slowness or weakness would expose them to the assaults of their enemies. The snail, which is destitute of sight, is of the colour of the bark of the trees which he gnaws, or of the wall in which he takes refuge.

Flat fishes, which are indifferent swimmers, such as the turbot, the flounder, the plaice, the burt, the sole, and

and several others, which are cut out as it were from a thin plank, because they were destined to a sedentary life close to the bottom of the Sea, are the colour of the sands where they find their nourishment, being spotted like the beach with gray, yellow, black, red, and brown. They are thus speckled, I admit, only on one side, but to such a degree are they possessed of the feeling of this resemblance, that when they find themselves inclosed within the parks formed on the strand to entrap them, and observing the tide gradually retiring, they bury their fins in the sand, expecting the return of the tide, and present to the eye only their deceitful side. It has such a perfect resemblance to the ground on which they squat to conceal themselves, that it would be impossible for the fishermen to distinguish them from it, without the help of sickles, with which they trace small fosses in every direction along the surface of the sand, to detect by the touch what the eye could not discern. Of this I have been a witness oftener than once, much more highly amused at the dexterity displayed by the fishes than at that of the fishermen.

The thornback, on the contrary, which is also a flat fish and a bad swimmer, but carnivorous, is marbled with white and brown, in order to be perceived at a distance by other fishes; and to prevent their being devoured in their turn by their enemies, which are very alert, such as the sea dog, or by their own companions, for they are extremely voracious. Nature has clad them in a prickly mail, particularly on the posterior part of the body, as the tail, which is most exposed to attack when they fly.

Nature.

Nature has bestowed at once, in the colours of innoxious animals, contrasts with the ground on which they live, and consonances with that which is adjacent, and has superadded the instinct of employing these alternately, according as good or bad fortune prompts. These wonderful accommodations may be remarked in most of our small birds, whose flight is feeble and of short duration. The gray lark finds her subsistence among the grass of the plains. Does any thing terrify her? she glides away and takes her station between two little clods of earth, where she becomes invisible. On this post she remains in such perfect tranquility, as hardly to quit it when the foot of the fowler is ready to crush her.

The same thing is true of the partridge. I have no doubt that these defenceless birds have a sense of those contrasts and correspondencies of colour, for I have remarked it even in insects. In the month of March last I observed, by the brink of the rivulet which washes the Gobelins,* a butterfly of the colour of brick, reposing with expanded wings on a tuft of grass. On my approaching him he flew off. He alighted at some paces distance on the ground, which at that place was of the same colour with himself. I approached him a second time; he took a second flight, and perched again on a similar stripe of earth. In a word, I found it was not in my power to oblige him to alight on the grass, though I made frequent attempts to that effect, and though the spaces

* A small village in the suburbs of Paris, noted for it's manufactures in fine tapestry and superb mirrors.—H. H.

of

of earth which separated the turfy soil were narrow and few in number.

This wonderful instinct is likewise conspicuously evident in the cameleon. This species of lizard, whose motion is extremely slow, is indemnified for this by the incomprehensible faculty of assuming at pleasure the colour of the ground over which he moves. With this advantage he is enabled to elude the eye of his pursuer, whose speed would soon have overtaken him. This faculty is in his will, for his skin is by no means a mirror. It reflects only the colour of objects, and not their form. What is farther singularly remarkable in this, and perfectly ascertained by Naturalists, though they assign no reason for it, he can assume all colours, as brown, gray, yellow, and especially green, which is his favourite colour, but never red. The cameleon has been placed for weeks together amidst scarlet stuffs, without acquiring the slightest shade of that colour. Nature seems to have with-held from the creature this shining hue, because it could serve only to render him perceptible at a greater distance; and farther, because this colour is that of the ground of no species of earth or of vegetable on which he is designed to pass his life.

But in the age of weakness and inexperience, Nature confounds the colour of the harmless animals with that of the ground on which they inhabit, without committing to them the power of choice. The young of pigeons, and of most granivorous fowls, are cloathed with a greenish shaggy coat, resembling the mosses of their nests. Caterpillars are blind, and have the complexion of the foliage and of the barks

which

which they devour. Nay the young fruits, before they come to be armed with prickles, or inclosed in cases, in bitter pulps, in hard shells, to protect their seeds, are during the season of their expansion green as the leaves which surround them. Some embryons it is true, such as those of certain pears, are ruddy and brown ; but they are then of the colour of the bark of the tree to which they belong. When those fruits have inclosed their seeds in kernels or nuts, so as to be in no farther danger, they then change colour. They become yellow, blue, gold-coloured, red, black, and give to their respective trees their natural contrasts. It is strikingly remarkable, that every fruit which has changed colour has seed in a state of maturity.

The insects, in like manner, having deposited their robes of infancy, and now committed to their own experience, spread abroad over the world to multiply the harmonies of it, with the attire and the instincts which Nature has conferred upon them. Then it is that clouds of butterflies, which in their caterpillar state were confounded with the verdure of plants, now oppose the colours and the forms of their wings to those of the flowers ; the red to the blue, the white to the red, the *antennæ* to the *stamina*, and fringes to the *corollæ*. I was one day struck with admiration at one of these, whose wings were azure, and besprinkled with specks of the colour of aurora, as he reposed in the bosom of a full-blown rose. He seemed to be disputing beauty with the flower. It would have been difficult to determine which way to adjudge the prize, in favour of the butterfly or of

the rose; but on seeing the flower crowned with wings of *lapis lazuli*, and the azure insect deposited in a goblet of carmine, it was obvious on the slightest glance, that their charming contrast greatly enhanced their mutual beauty.

Nature does not employ those agreeable correspondencies and contrasts in the decoration of noxious animals, nor even of dangerous vegetables. Of what ever kind the carnivorous or venomous animals may be, they form at every age, and wherever they are, oppositions harsh and disgusting. The white bear of the north announces his approach over the snow by a hollow noise, by the blackness of his snout and paws, and by a throat and eyes the colour of blood. The ferocious beasts which hunt for their prey in the gloom of darkness, or in the solitude of the forests, give notice of their presence by loud roarings, lamentable cries, eyes inflamed, urinous or fetid smells. The crocodile, in ambush among the flags upon the shores of the rivers in Asia, where he assumes the appearance of the trunk of a tree turned upside down, betrays himself from afar by strong exhalations of the smell of musk. The rattlesnake, concealed in the grassy swamps of America, cannot stir without sounding his ominous alarm. The very insects which make war on others are clad in sable attire, in which colours are harshly opposed, and in which black particularly predominates, and clashes disagreeably with white or yellow. The humble-bee, independently of his buzzing noise, announces himself by the blackness of his breast-plate and his large belly bristled over with yellow hairs. He appears amidst

amidst the flowers like a burning coal half extinguished. The carnivorous wasp is yellow, and striped with black like the tiger. But the useful bee is of the complexion of the *stamina* and of the *calices* of the flowers among which she reaps her innocent harvests.

Poisonous plants present, like noxious animals, disgusting contrasts, from the livid colours of their flowers, in which black, deep blue and a smoky violet are in harsh opposition with the tender shades; from their nauseous and virulent smells; from their prickly foliage, of a dark green hue, and clashing with white on the under-side: such are the aconite tribes. I am acquainted with no plant of an aspect so hideous as those of this family, and among others that which the French denominate *napel*, the most venomous vegetable of our climates. I shall not take upon me to determine whether the embryons of their fruits do not disclose, from the very first moments of their expansion, harsh oppositions, which give warning of their malefic characters: if it be so, they have this farther resemblance in common to them with the young of ferocious animals.

Such of the brute creation as are intended to live on two different grounds are impressed with a double contrast in their colours. Thus, for example, the king-fisher, which skims along rivers, is at once musk-coloured and glazed over with azure; so as to be detached from the dusky shores by his azure colour, and from the azure of the waters by his musk-colour. The duck, which dabbles on the same shores, has the body tinged of an ash-colour, while

the head and neck are of an emerald-green; so that he is perfectly distinguishable by the gray colour of his body from the verdure of the aquatic plants among which he waddles, and by the verdure of his head and neck from the dark coloured mud where he finds part of his food, and in which, by another most astonishing contrast, he never soils his plumage.

The same contrasts of colour are observable in the wood-pecker, who lives on the trunks of trees, along which he scrambles in quest of the insects that are lodged under their rind. This bird is at once green-coloured and brown; so that though he lives, properly speaking, in the shade, he is always perceptible however on the trunk of trees; for he detaches himself from their dusky rind by means of that part of his plumage which is of a brilliant green, and from the verdure of their mosses and lichens by those of his feathers which are brown.

Nature opposes then the colours of every animal to those of the respective ground on which it is to be placed; and what confirms the truth of this Law is, that the greatest part of birds which live on one ground only have but a single colour, and that one strongly contrasted with the colour of the ground. Accordingly the birds which live aloft in the air on the azury ground of the Heavens, or on the bosom of the waters in the midst of lakes, are mostly white, which of all colours forms the most striking contrast with blue, and is consequently most adapted to render them perceptible at a distance. Such are between the Tropics, the paillençu, a bird of a glossy white, whose flight is through the superior regions of the air, the

the heron, the gull, the sea-mew, which skim along the surface of the azure deep, and the swan, fleets of which navigate the extensive lakes of the North.

There are likewise others which in order to form a contrast with those that I have last mentioned, detach themselves from the skies and from the waters by their black or dusky colours: such are, for example, the crow in our own climates, which is perceptible at so great a distance in the Heavens on the white ground of the clouds; many sea-fowls of a brown and blackish colour, as the frigat of the Tropics, which plays through the air amidst storm and tempest; the mower, or sea-cutter, a water-bird, which grazes with his dark-coloured wings, shaped like a scythe, the white surface of the foamy billows of the Ocean.

From these examples therefore it may be inferred, that when an animal is invested with but one single tint he is intended but for one situation; and when he combines in himself the contrast of two opposite tints, that he lives on two grounds, the colours themselves of which are determined by that of the plumage or of the hair of the animal. We must be upon our guard at the same time against an unlimited generalization of this Law. We ought to consider it as harmonizing with the exceptions which wise Nature has introduced and established for the very preservation of animals; such as, in general, the whitening of them to the North in the Winter season, and on lofty mountains, as a remedy against excess of cold, by arraying them in a colour which reflects the most heat; and embrowning them to the South,

during the ardors of Summer and on sandy districts, and thereby sheltering them from the effects of burning heat by the intervention of absorbent colours. What evidently demonstrates that these great effects of harmony are not mechanical results of the influence of the bodies which surround animals, or of the apprehensions of the mother on the tender organs of the fœtus, or of the action of the rays of the Sun on their plumage, according to the explications hitherto attempted by our systems of physic; what evidently demonstrates this, I say, is, that among the almost infinite number of birds which pass their life in the higher regions of the air, or on the surface of the Seas, whose colours are azure, there is not a single bird of the colour of blue; and that on the contrary many birds which live between the Tropics, in the bosom of black rocks, or under the shade of sullen forests, are azure coloured: such are the Batavia hen, which is blue all over; the Dutch pigeon of the Isle of France, and many others.

Another consequence equally important may be deduced from these observations; it is this, that all these harmonies are contrived for the use of Man. A blue-coloured fowl on the azure ground of the sky, or on the surface of the waters, would elude our sight. Nature besides has reserved the rich and agreeable colours only for the birds which live in our vicinity. This is so indubitably certain, that though the Sun acts between the Tropics with the whole energy of his rays on the fowls whose residence is the wide Ocean, there is not a single one of them arrayed in a beautifully coloured plumage, whereas those

those which inhabit the shores of the Seas and of the rivers are frequently dressed in the most gorgeous attire. The flamingo, a tall bird which lives in the swampy shores of the South Seas, has a white plumage charged with carmine. The toucan on the same strands has an enormous bill of the most lively red; and when he retires from the bosom of the humid sands where he finds his food, you would be tempted to say that he has just fished out of them a stump of coral. There is another species of toucan whose beak is white and black, as finely polished as if it consisted of ebon and ivory. The pintada with speckled plumage, the peacock, the duck, the kingfisher, and a multitude of other river-birds, embellished by the enamel of their colours the banks of the Asiatic and African streams. But we find nothing once to be compared with them in the plumage of such as inhabit the open Sea, though they are still more exposed to the influences of the Sun.

As a farther consequence of these correspondencies with Man, Nature has given to the birds which live remote from him, cries shrill, hoarse, and piercing, but which are as proper as their ill assorted colours to render them perceptible at a distance amidst their wild retreats. She has bestowed on the contrary sweet notes and melodious voices on the little birds which people our groves and domesticate themselves in our habitations, in order to heighten our delight, as well by the music of their warblings as by the beauty of their colours. We repeat it, in order to confirm the truth of the principles of the harmonies which

we are laying down: Nature has established an order of beauty so real in the plumage and song of birds, that she has endowed with these such birds only whose life was in some sort innocent relatively to Man, as those which are granivorous or which live on insects; and she has denied those advantages to birds of prey and to most sea-fowls, which in general have earthy colours and disagreeable cries.

All the kingdoms of Nature present themselves to Man with the same correspondencies, the abysses of the Ocean themselves not excepted. The fishes which live on animal sustances, as the whole class of the cartilaginous do, such as the seal, the sea-dog, the shark, the slipper, the thornback, the polypus, and many others, have disgusting forms and colours. Fishes which live in the open sea have colours marbled with white, black, brown, which distinguish them in the bosom of the azure billows, such are whales, blowers, porpoises, and others. But it is among those which frequent the dusky shores, and particularly in the number of such as are denominated *saxatile*, because they live among the rocks, that we find the fishes, the lustre of whose skin and scales far surpasses all the efforts of the pencil, especially when they are alive. It is thus that legions of mackarel and herrings diffuse the radiance of silver and azure over the northern strands of Europe.

It is around the black rocks which bound the Seas of the Tropics, that the fish known by the name of *captain* is caught. Though his colours vary with the latitude, it is sufficient, in order to convey an idea of

of his beauty, to detail the description given of it by *Francis Cauche*,* in a species caught on the coasts of Madagascar. He says that this fish, which takes pleasure in the rocks, is streaked in the form of lozenges; that his scales are of a pale gold-colour, and that his back is coloured and glazed over with laca, inclining in several places toward vermilion. His dorsal fin and tail are waved with azure, fading away into green toward the extremities.

About the bottom of the same rocks is likewise found the magnificent fish called the *sardin*, and by the Brazilians *acara pinima*, of which *Marcgrave* has given the figure in his 4th Book, Chap. 6. This beautiful fish is adorned with scales of at once a gold and silver hue, crossed from head to tail by black lines, which admirably heighten their lustre. The same Author describes a variety of species of the moon-fish besides, which frequent the same places.

For my own part, I have amused myself on the rocks of the Island of Ascension, in observing for hours together the moon-fish sporting amidst the tumultuous waves which are incessantly breaking upon them. These fishes, of which there are various species, have the rounded and sometimes sloping form of the orb of night whose name they bear. They are besides, like her, of the colour of polished silver. They seem destined to elude the sagacity of the fisherman in every possible way; for they have their belly streaked with black cross-stripes of a lozenge form, which gives them all the appearance of being caught in a net; they seem every instant on

* Consult *Francis Cauche*, his relation of Madagascar.

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the point of being tossed on shore by the agitation of the billows in which they play; farther, their mouth is so small that they frequently nibble away the bait without touching the hook; and their skin without scales, like that of the seal, is so hard, that the harpoon often misses it's blow be the prongs ever so keenly whetted. *Francis Cauche* likewise says, that it requires a very violent exertion to make an incision into their skin with the sharpest knife.

It is on the same shores of Ascension-island that we find the *murena*, a species of lamprey, or eel of the rocks, which is excellent food, and whose skin is besprinkled with gilded flowers. It may be affirmed in general, that every rock in the sea is frequented by a multitude of fishes of the most brilliant colours; such as the gilt-head, the perroquet, the zebra, the roach, and others without number, the very classes of which are unknown to us. The more that the rocks and shallows of any sea are multiplied, the more varied likewise are the species of the saxatile fishes which resort thither. For this reason it is that the Maldivia-islands, which are so numerous, furnish themselves alone a prodigious multitude of fishes of very different colours and forms, with the greatest part of which our Ichthyologists are hitherto totally unacquainted.

As often therefore as you see a brilliant fish, you may be assured that his habitation is near the shore, and that, on the contrary, he lives in the open Ocean if he is of a dark colour. The truth of this may be ascertained by ourselves in the channels and on the banks

banks of our own rivers. The silver smelt and the blay, whose scales are employed in the formation of mock pearls, play on the strand of the Seine; whereas the eel, of the gloomy colour of slate, takes pleasure to dabble in the midst and at the bottom of the stream. We must not however pretend to generalize these Laws to the exclusion of all exceptions. Nature, as has been said, subjects all to the mutual adaptation of beings, and to the enjoyment of Man. Thus, for example, though the fishes on the shores have in general shining colours, there are however several species of them invariably of a dark colour. Such are not only those which swim indifferently, as soles, turbots, &c. but those also which inhabit some parts of the shores whose colours are lively. Thus the tortoise, which pastures at the bottom of the sea on green herbs, or which crawls by night over the white sands there to deposit her eggs, is of a shady colour; thus the lamentine, which enters into the channel of the rivers of America in quest of food, in the verdure of their banks, without leaving the water, detaches himself from that verdure by the brown colour of his skin.

The saxatile fishes, which can easily insure their safety among the rocks by agility in swimming, or by the facility of finding a retreat in their cavernous receptacles, or of there defending themselves against their enemies by the armour which Nature has bestowed, have all of them lively and shining colours, the cartilaginous excepted: such are the blood-coloured crabs, the azure and purple lobsters, called

langouste

langouste and *homard*, and among others that to which *Rondelet* has given the name of *Thetis*, on account of it's beauty, the violet-coloured urchins armed with points and spears, the nerits, inclosed in a spiral case, with rose and grey coloured ribbons winding round it, and an endless variety of others.

It is very remarkable that all shell-fish which walk, and migrate, and consequently have the power of choosing their asylum, are those in their kind which have the richest colours: such are the nerits which I have just mentioned, the purple fish, or Venus shell, resembling polished marble, the olives, shaded like velvet of three or four colours, the harp, embellished with the tints of the most beautiful tulips, the tunny, speckled like the partridge's wing, which walks along under the shade of the madrépores; and all the families of the univalves, which force their way into the sand for shelter, the bivalves, as the ducal-cloak, scarlet-coloured and orange, and a multitude of other migrating shell-fish, are impressed with colours the most lively, and form with the different grounds of the Sea secondary harmonies totally unknown.

But those which do not change their situation, as most of the oysters of the seas to the southward, which frequently adhere to the rocks, or those which are perpetually at anchor in straits, as muscles and the *pinna-marina*, attached to pebbles by threads, or those which rest on the bosom of the madrépores, like vessels on the stocks, as the Noah's ark, or those which are entirely buried in the heart of calcareous rocks, as the dail of the Mediterranean, or such as

are

are immovable from their weight, which sometimes exceeds that of several quintals, and pave the surface of flats, as the thuilée of the Moluccas, and the large bivalves, as the rocks, the burgos, &c. or those, in a word, which I believe are blind, like our land-snails, such as lempits, which fasten themselves by the formation of a vacuum on the shining surface of the rocks, are of the colour of the ground which they inhabit, in order to be less perceptible to their enemies.

It is farther very highly worthy of observation, that though many of those sedentary shell-fish are clothed in a brown and shaggy outward garment, as those which are called cornets and rollers; or with a black pellicle of the shade of the pebbles to which they are attached, as the Magellan-muscles; or encompassed with a mud-coloured tartar, as the lempit and the burgo: they have, under their gloomy upper-coats, pearly appearances and tints, the beauty of which frequently exceed those of the shell-fish whose apparent colours are the most brilliant. Thus the Magellan-lempit, cleansed of it's tartar by means of vinegar, presents the richest of cups, shaded with the colours of the finest tortoise-shell, and blended with a burnished gold, which is perceptible through a chestnut-coloured varnish. The large muscle of Magellan's strait conceals in like manner, under it's black coat, the oriental shades of the aurora.

It is impossible to ascribe, as in the shell-fish of India, colours so charming to the action of the Sun on these shells, covered as they are with tartars and rough

rough coats, and which are the clothing of fish that live beside in a foggy climate, abandoned for a great part of the year to gloomy Winters and long tempests. We may venture to affirm that Nature has veiled their beauty only to preserve it for the enjoyment of Man, and has placed them only on the verge of the shores, where the Sea purifies them by tossing them about, to put them within his reach. Thus, by a most wonderful constrast, she places the most brilliant shells in regions the most exposed to the ravages of the elements; and by another contrast, no less astonishing, she presents to the poor Patagonians spoons and cups, the lustre of which far surpasses beyond all contradiction the richest plate of polished Nations.

Hence it may be inferred that fishes in general, and shell-fish in particular, which have two opposite colours, live on two different grounds, as we have observed in the case of birds, and that those which have only one colour frequent only one ground. I recollect that on making the tour of the Isle of France on foot, along the shore of the Sea, I found upon it nerits with an ash-gray ground encircled with red ribbons, sometimes on the dusky rocks, sometimes on the white madrépores, with their peach-coloured flowers. They contrasted in the most agreeable manner, and appeared at the bottom on the sea-plants like fruit growing upon them. I likewise found there the Venus-shell completely white, with a rose-coloured mouth, swelled backward like eggs, from which too they sometimes borrow their name. But

it

it is now impossible for me to affirm with certainty, whether they adhered to the dark coloured rocks or to the white madrépores.

There are likewise to be found on the coasts of Normandy, in the district of Caux, two sorts of rocks, the one of white marl detached from the cliffs, the other formed of black bisets, which are amalgamated with the craggy cliff. Now I never saw there, in general, but two sorts of periwinkles, called by the country people *vignots*; the one very common and used as food, which is quite black, and the other white, with a faint-red mouth. I presume not at this distance to aver, whether the white periwinkles attach themselves to the white rocks, and the black periwinkles to the black rocks, or contrariwise, for I did not make the observation. But whether they form with those rocks consonances or contrasts, it is very singular that, as there are but two species of rocks, so there should be but two species of periwinkles. I am inclined to believe, that the black periwinkle adheres in preference to the black rock; for I have observed in the Isle of France that there is neither black-coloured periwinkle nor muscle, because there is in those seas no pebble or rock precisely of that colour; and I am perfectly certain, that muscles are always of the colour of the ground on which they live: those of the Isle of France are brown.

It must not be concluded, on the other hand, that such shell-fish are indebted for their colours to the rocks on which they adhere by suction; for it would thence

thence follow, that the rocks of Magellan's strait, which produce muscles and lempits so rich in colouring, should be themselves inlaid with mother-of-pearl, opal, and amethyst; besides, every rock maintains shell-fish of very different colours. You find at the bottom of the rocks on the coast of the district of Caux, which are loaded with black periwinkles, the azure-coloured lobster, the crab marbled with red and brown, legions of muscles of a deep blue, with lempits of an ash-gray. All these fishes when alive form harmonies the most agreeable with a multitude of marine plants, which fringe those black and white rocks with their tints of purple, gray, rust-coloured, brown, and green; and with the variety of their forms and aggregations, like oaken boughs, tufts of different shapes, garlands, festoons, and long cordage, agitated by the waves in every possible manner. In truth there is no Painter capable of composing similar groups, let him give what scope he pleases to his imagination. Many of those marine harmonies have escaped me, for I then considered them as merely the effect of chance. I looked at them, I admired them, but I observed them not: I suspected however, even then, that the pleasure which their harmonic combination inspired must be referable to some Law with which I am unacquainted.

Enough has been said to demonstrate how much Naturalists have mutilated the finest portion of Natural History, by retailing, as they for the most part do, isolated descriptions of animals and of plants, without saying a word of the season when and of the place

place where they are to be found. By this negligence they strip them of all their beauty; for there is not an animal nor a plant existing, whose harmonic point is not fixed to a certain situation, to a certain hour of the day or of the night, to the rising or the setting of the Sun, to the phases of the Moon, nay to the very tempests: to say nothing of the other contrasts and correspondencies which result from these.

I am so thoroughly persuaded of the existence of all those harmonies, that I entertain not the slighest doubt that, on seeing the colour of an animal, one might be able to determine nearly that of the ground which it inhabits; and that by following up those indications, a road might be paved to very curious discoveries. For example, we have not hitherto found on any shore the *cornu d'ammon*, that fossil so common, and of a size so considerable, in our quarries. I think we ought to look for that brown coloured shell-fish in grassy marine places, such as those in which the sea-tortoise pastures. I do not know that any one has hitherto thought of dragging those bottoms, because of the abundance of sea-plants which grow upon them, and because they are frequently of a great depth, and at a great distance from the coasts, such as those which surround the Cape-de-Verd islands, or, according to others, toward Florida, and which at certain seasons set their herbage a-floating in such quantities, that the Sea is covered with it for the space of thirty or forty leagues, and ships can with difficulty force their way through it. If the most brilliant shells are to be

found on dark grounds, dusky shells ought to be found on green grounds.

We meet with those contrasts even in the brute soils of the earth, as I could evince to demonstration, did time permit. The following simple strain of reasoning is sufficient to ascertain the truth of this. If an uniform and mechanical cause had produced the Globe of the Earth, it must have been universally of the same matter, and of the same colour: the hills, the mountains, the rocks, the sands, must have been amalgams, or the rubbish of each other; but this is not found to be the case in any one district of however small extent. In general, as has been said, the soil is white to the North, and dark-coloured to the South, in order to reflect the heat in the first case, and to absorb it in the second; but notwithstanding these general dispositions, you find in every place, in particular, the most wonderful variety. In the same canton may be found red mountains, black rocks, white plains, and yellow sands. Their substance is as much varied as their colour; there are granites, calcareous stones, gypses or plasters, and vitrifiable sands.

In the Isle of France, the rocks of the mountains are blackish, the earth in the valleys is red, and the sands on the shore are white. The rocks there are vitrifiable, and the sands calcareous. When I was in that island, a private adventurer having formed the plan of a glass manufactory, the process turned out the directly contrary of what he had proposed; for, upon lighting up his furnace with great formality

lity and pomp, the sand of which he expected to make glass changed into chalk, and the stones of his furnace became vitrified. Though it be a rare thing to see white earths between the Tropics, white sands are however common there upon the shores. It is certain that this colour from it's lustre, and it's refraction to the Horizon, renders low lands perceptible at a very great distance, as has been well remarked by *John-Hugo de Linschoten*, who, but for those sentinels planted by Nature on most of the gloomy and low coasts of India, must there have several times made shipwreck. On the coasts of the Païs de Caux the sands are gray, but the cliffs are white; together with this they are divided into black and horizontal stripes of pebbles which form contrasts very perceptible at a great distance.

There are places where we find white rocks and red lands, as in quarries of mill-stone; from these result very agreeable effects, especially in connection with their natural accessories of vegetables and of animals. I should digress too far, were I to enter into any detail on this subject. It is sufficient for me at present to recommend to Naturalists to study Nature, as the great Painters do; that is, by uniting the harmonies of the three kingdoms. Every one who shall observe in this manner will find a new light diffused over the perusal of Voyages and of Natural History, though their Authors scarcely ever speak of those contrasts, except by chance, and without expressing any doubt about the matter. But every man will be himself in a condition to discover

their delightful effects in what is called brute Nature, I mean that with which Man has not intermeddled. Let me suggest the infallible means of distinguishing them: it is simply this, as often as a natural object presents to you a sentiment of pleasure, you may rest assured that it exhibits some harmonic concert.

Beyond all doubt animals and plants of the same climate have not received from the Sun nor from the elements liveries so varied and so characteristic. A thousand and a thousand new observations may be made upon their contrasts. He who has not seen them in their natural place has not yet become acquainted with their beauty or their deformity. Not only are they in opposition to the grounds of their respective habitations, but they are so likewise between themselves as to genus and genus; and it is worthy of remark that when these contrasts are established they exist in all the parts of the two individuals. We shall speak somewhat of those plants in the following Study, by simply glancing at that delightful and inexhaustible subject.

Those of animals are still farther extended; they are opposed not only in forms and in gestures, but in instincts; and with differences so decidedly marked, they love to associate with each other in the same places. It is this consonance of tastes which distinguishes, as I have said, beings which are in contrast, from those which are contrary or enemies. Thus the bee and the butterfly extract the nectar of the same flowers; and the single-hoofed horse snuffing up the wind,

wind, with his mane flowing over his graceful neck, delights to amble about airily over the same meadows on which the ponderous bull impresses his cloven foot; the dull and steady ass takes pleasure in scrambling over the rocks where the capricious goat frisks and bounds; the cat and the dog live peaceably by the same fire-side, unless where the tyranny of Man has vitiated their dispositions by a treatment calculated to excite hatreds and jealousies between them.

Finally contrasts exist not only in the Works of Nature in general, but in each individual in particular, and constitute as well as consonances the organization of bodies. If you examine one of those bodies, of whatever species it may be, you will remark in it forms absolutely opposite, and nevertheless consonant. It is thus that in animals the excretory organs contrast with those of nutrition. The long tails of horses and bulls are opposed to the large size of their heads and of their necks, and come in as a supplement to the motions of these anterior parts, which are too unwieldy to drive away the insects that infest them. On the contrary the broad tail of the peacock forms a contrast with the length of the neck, and the smallness of the head of that magnificent bird. The proportions of other animals present oppositions which are no less harmonic, nor less happily adapted to the necessities of each species.*

Harmonies,

* This Law of contrasts is, if I am not mistaken, a delicious source of observation and discovery. The women, I repeat it, always nearer to Nature than we are, employ it continually in the

Harmonies, consonances, progressions, and contrasts, must therefore be reckoned among the first elements of Nature. To these we are indebted for the

assortment of the colours which they use in dress, whereas no Naturalist, as far as I know, has ever observed that Nature herself acts in conformity to it in the harmony of all her Works. Any one may find a demonstration of this without stirring beyond his own house. For example, though there be among dogs a singular variety of colours, never was any one seen red, green, or blue: but they are for the most part of two opposite tints, the one clear and the other dark, in order that in whatever part of the house they are, they may be perceptible on the furniture, with the colour of which they would frequently be confounded.

But though the colours of these animals be taken, as well as those of most quadrupeds, from the two extreme terms of the progression of colours, that is black and white, I do not recollect that I ever saw a dog completely white or completely black. White dogs always have some spots on their skins, were it but the tip of the snout of a dark colour. Such as are black or brown have streaks of white or fire-coloured specks: so that wherever they are you can easily perceive them. I have farther remarked in them this instinct, especially in dogs of a dusky colour; when they want to lie down they always resort to a white-coloured ground in preference to one of any other colour. The Ladies well know this to be the case; for if there happens to be a little dog of a dark hue in an apartment where company is assembled, he hardly ever fails to go to repose at a Lady's foot and on her petticoats.

The instinct which prompts the dog to retire to rest on white stuffs, arises from the feeling which he himself has of the contrast affected by the fleas by which he is frequently tormented. Fleas in whatever place resort to white-coloured objects. If you enter into a room where there are many of those insects, if you happen to have white stockings these will instantly attract them. They will even crowd to a single sheet of white paper. And this is the

reason

the sentiments of order, of beauty, of pleasure, which spring up in the mind at the sight of her Works; and from her absence arise the uneasy feelings of disorder,

reason why light-coloured dogs are much more infested by them than others. I have likewise observed that wherever there are dogs of a white colour, the black and the brown pay court to them, and give them a decided preference as play-mates, undoubtedly to get rid of the fleas at their expence. In saying this, however, I do not mean to throw an imputation of treachery on their profession of friendship. Were it not for the instinct of these minute, black, nimble, nocturnal insects toward the white colour, it would be impossible to perceive and to catch them.

The common deep-coloured fly resorts in like manner to white and brilliant objects; and this accounts for the tarnishing of every thing glossy or gilded in our apartments. The flesh-fly delights on the contrary to settle on the livid colours of meat in a state of putridity. His blue corselet makes him easily discernible on that ground.

If we extend these contrasts farther, we shall find that not only all sanguiniverous insects have the instinct of opposing their colours to those of the situations in which they live, but all carnivorous animals likewise; whereas all feeble, gentle, and innoxious animals, as we have seen, are furnished with means and instincts of consonance with the ground on which they are made to inhabit. Thus has Nature willed it should be, in order that the first might be perceived by their enemies, and that the second might be enabled to escape them.

From those natural Laws might be deduced a multitude of useful and agreeable consequences, tending to the improvement of our habitations in respect of cleanliness and conveniency. For example, in order the more readily to destroy the insects which disturb our sleep, and which are so common in Paris, it would be proper to have the alcoves, the staining, the drapery, the wooden frames of our beds of white or faint colours; on which insects might be easily perceived.

order, ugliness, languor, and disgust. They extend equally to all the kingdoms: and though I have limited myself, in the sequel of this Work, to an examination of their effects in the vegetable kingdom only, it is impossible for me however to deny myself the pleasure of indicating them, at least in the human figure. It is here that Nature has combined all the harmonic expressions in their highest degree of excellency. All I can do is to trace a feeble sketch of it. To acknowledge the truth, this is not precisely the proper place, neither have I leisure to arrange more than a part of the observations which I have collected on this vast and interesting subject. But the little which I am going to advance will be

As to conveniency, every one must be sensible how necessary it is that the colours of different pieces of furniture should form a contrast for the purpose of being distinguished with facility. I am frequently at a loss, for instance, to know what is become of my snuff-box, because it is black like the table on which I put it down. If Nature had not been possessed of more intelligence than I am the greatest part of her Works would utterly disappear. It is very astonishing that Philosophers who have pursued so many curious researches respecting the nature of colours, should never have suggested a syllable respecting their contrast, without which nothing would be distinguishable; or rather their forgetfulness is not surprising: Man is incessantly pursuing the illusion which escapes him, and neglects the useful truth which is lying at his foot.

The harmonies of colours have besides a mighty influence upon the passions: but I must not presume to say any thing with regard to this in the Country where the Women employ them with such unbounded sway. To the Women I stand indebted for the first idea I had of studying the elements of the Laws by which Nature herself strives to communicate pleasure to us.

sufficient

sufficient to overturn the position maintained by men of but too high celebrity in the World of Science, namely, That human Beauty is arbitrary.

I will even go so far as to flatter myself with the hope that these rude Essays may induce wise men who love Nature, and who wish to be acquainted with her Laws, to dig into the recesses of this vast mountain of hidden treasure, in which Truth lies buried. Their multiplied illumination will conduct them without difficulty through the whole extent of that invaluable mine, of which, groping like a blind man, I have traced only the first superficial furrows. They will be led on from one rich vein of precious ore to another still richer, since even I, if I may presume to say so, have been able at the bottom of a valley, and on the sandy bed of a little rivulet, to pick up a few straggling grains of gold.

SEQUEL.

SEQUEL TO STUDY X.

OF THE HUMAN FIGURE.

ALL the harmonic expressions are combined in the Human Figure. In treating this article, I shall confine myself to the examination of some of those which compose the head of Man. Observe it's form is an approximation to the spherical, which as we have seen, is *the* form by way of excellence. I do not believe that this configuration is common to it with that of any animal whatever. On it's anterior part is traced the oval of the face, terminated by the triangle of the nose, and encompassed by the radiations of the hair. The head is, besides, supported by a neck of considerably less diameter than itself, which detaches it from the body by a concave part.

This slight sketch presents to us at first glance the five harmonic terms of the elementary generation of forms. The hair exhibits lines; the nose the triangle; the head the sphere; the face the oval; and the void under the chin the parabola. The neck which like a column sustains the head, exhibits likewise the very agreeable harmonic form of the cylinder, composed of the circular and quadrilateral.

These forms, however, are not traced in a stiff and geometrical manner, but imperceptibly run into each other,

other, and mutually blend as the parts of the same whole ought to do. Thus the hair does not fall in straight lines, but in flowing ringlets, and harmonizes with the oval of the face. The triangle of the nose is neither acute, nor does it present a right angle; but, by the undulatory swelling of the nostrils, presents a harmony with the heart-form of the mouth, and sloping toward the forehead, melts away into the cavities of the eyes. The spheroid of the head in like manner amalgamates with the oval of the face. The same thing holds with respect to the other parts, as Nature employs in their general combination the roundings of the forehead, of the cheeks, of the chin, of the neck, that is, portions of the most beautiful of harmonic expressions, namely the sphere.

There are farther several remarkable proportions which form with each other very pleasing harmonies and contrasts; such is that of the forehead, which presents a quadrilateral form in opposition to the triangle, composed of the eyes and the mouth; and that of the ears, formed of very ingenious acoustic curves such as are not to be met with in the auditory organ of animals, because in the case of mere animals the ear is not intended to collect, like that of Man, all the modulations of speech.

But I must be permitted to expatiate somewhat more at large on the charming forms assigned by Nature to the eyes and the mouth, which she has placed in the full blaze of evidence, because they are the two active organs of the soul. The mouth consists of two lips, of which the upper is moulded into the shape of a heart, that form so lovely as to have become

become proverbial for it's beauty ; and the under is rounded into a demi-cylindric segment. In the opening between the lips we have a glimpse of the quadrilateral figure of the teeth, whose perpendicular and parallel lines contrasts most agreeably with the round forms adjoining, and so much the more, as we have seen that the first generative term being brought into union with the supremely excellent harmonic term, that is, the straight line with the spherical form, the most harmonic of all contrasts results from it.

The same relations are to be found in the eyes, the forms of which combine still more the harmonic elementary expressions ; as it was fit the chief of all the organs should do. They are two globes fringed on the lids with eye-lashes, radiating with divergent pencil-strokes, which form with them a most delightful contrast, and present a striking consonance with the Sun, after which they seem to have been modelled, having like that orb a spherical figure, encircled with divergent rays in the eye-lashes ; having a movement of self-rotation, and possessing the power, like him, of veiling themselves in clouds by means of their lids.

The same elementary harmonies may be traced in the colours of the head, as well as in its forms ; for we have in the face the pure white exhibited in the teeth and in the eyes ; then the shades of yellow which dissolve into it's carnation, as the Painters well know ; after that the red, the eminently excellent colour, which glows on the lips and on the cheeks. You farther remark the blue of the veins, and sometimes that of the eye-balls ; and finally the black of the

the hair, which by it's opposition gives relief to the colours of the face as the vacuum of the neck detaches the forms of the head.

You will please to observe, that Nature employs not, in decorating the human face, colours harshly opposed; but blends them, as she does the forms softly and insensibly into each other. Thus the white melts here into the yellow, and there into the red. The blue of the veins has a greenish cast. The hair is rarely of a jet black; but brown, chesnut, flaxen, and in general of a colour into which a slight tint of the carnation enters, in order to prevent a violently harsh opposition. You will farther observe, that as she employs spherical segments in forming the muscles which unite the organs, and in order particularly to distinguish these very organs, she makes use of red for the same purposes. She has accordingly extended a slight shade of it to the forehead, which she has strengthened upon the cheeks, and which she has applied pure and unmixed to the mouth, that organ of the heart, where it forms a most agreeable contrast with the whiteness of the teeth. The union of this colour with that harmonic form is the most powerful consonance of beauty; and it is worthy of remark, that wherever the spherical forms swell, there the red colour strengthens, except in the eyes.

As the eyes are the principal organs of the soul, they are destined to express all its emotions; which could not have been done with the harmonic red tint, for this would have given but one single expression. Nature, in order there to express the contrary passions, has united in the eye the two most opposite of

colours

colours, the white of the orbit and the black of the iris, and sometimes of the ball, which form a very harsh opposition, when the globes of the eyes are displayed in the full extent of their diameter; but by means of the eyelids, which Man can contract or dilate at pleasure, he is enabled to give them the expression of all the passions from love to fury.

Those eyes whose balls are blue are naturally the softest, because the opposition in this case is less harsh with the adjacent white; but they are the most terrible of all when animated with rage, and this, from a moral contrast which constrains us to consider those as the most formidable of all objects, that menace evil, after having encouraged us to expect good. Persons therefore who are thus distinguished, ought to be carefully on their guard against treachery to that character of benevolence bestowed on them by Nature; for blue eyes express by their colour something enchantingly celestial.

As to the movements of the muscles of the face, it would be extremely difficult to describe them, though I am fully persuaded it might be possible to explain their Laws. Whoever shall attempt this, must of necessity refer them to the moral affections. Those of joy are horizontal, as if the soul, in the enjoyment of felicity, had a disposition to extend itself. Those of chagrin are perpendicular, as if, under the pressure of calamity, the mind was looking toward Heaven for refuge, or seeking it in the bosom of the earth. Into such an explanation of the Laws of muscular motion must likewise enter the alterations of colours, and the contractions of forms, and in these at least

we

we shall discover the truth of the principle which we have laid down, that the expression of pleasure is in the harmony of contraries blending with each other in colours, forms, and motions; and that the expression of pain consists in the violence of their oppositions. The eyes alone have motions ineffable; and it is remarkable, that under the influence of very strong emotions they are suffused with tears, and thus seem to have a farther analogy with the orb of day, who in the season of tempests shrouds himself in rainy distillations.

The principal organs of sense, four of which are placed in the head, have particular contrasts, which detach their spherical forms by means of radiated forms; and their shining colours by means of dusky tints. Thus the bright organ of vision is contrasted by the eye brows; those of smell and taste by the mustaches; the organ of hearing by that part of the hair called the *favourite* lock, which separates the ear from the face; and the face itself is distinguished from the rest of the head by the beard and by the hair.

We shall not here examine the other proportions of the human figure in the cylindric form of the neck, opposed to the spheroïd of the head, and to the plane surface of the breast; the hemispherical forms of the paps, which contrast with the flatness of the chest; as well as the cylindrical pyramids of the arms and fingers with the omoplate of the shoulders; the consonances of the fingers with the arms, by means of three similar articulations, with a multitude of other curvatures and of other harmonies, which

which hitherto have not so much as a name in any language, though they are in every country the all-powerful expression of beauty.

The human body is the only one which unites in itself the modulations and the concerts, inexpressively agreeable of the five elementary forms and of the five primordial colours, without exhibiting any thing of the harsh and rude oppositions perceptible in the brute creation, such as the prickles of the hedge-hog, the horns of the bull, the tusks of the wild-boar, the fangs of the lion, the marbled skin of the dog, and the livid and disgusting colours of venomous animals. It is the only one of which the first touch is perceptible, and which you can see completely; other animals being disguised under hair, or feathers, or scales, which conceal their limbs, their shape, their skin. Farther, it is the only form which, in it's perpendicular attitude, displays all it's positions and directions at once; for you can hardly perceive more of a quadruped, of a bird, of a fish, than one half, in the horizontal position which is proper to them, because the upper part of their body conceals the under.

We must likewise remark, that Man's progressive motion is subject to neither the shocks nor the tardiness of movement of most quadrupeds, nor to the rapidity of that of birds; but is the result of movements the most harmonic, as his figure is of forms and of colours the most delightful.*

The

* It has been maintained by certain celebrated Authors, that the Negroes consider their own colour as more beautiful than that of the whites; but it is a mistake. I have put many a question on

The more that the multiplied consonances of the human figure are agreeable, the more disgusting are it's dissonances. This is the reason that, on the face

on this subject to black people who were in my own service in the Isle of France, and who were at perfect liberty to tell what they really thought, especially on a subject so indifferent to slaves, as the beauty of the whites. I sometimes asked them whether of the two they would prefer, a black wife or a white? They never hesitated an instant in declaring their preference of the white women. Nay, I have seen a Negro who had been almost flayed alive by the whip, in one of our plantations, express the highest delight when the scars of his sores began to whiten, because it suggested the hope that he was thereby going to change colour, and to be negro no longer. The poor wretch would gladly have parted with his whole hide to become white. This preference we shall be told is, in that case, the effect of the superiority which they are obliged to ascribe to the Europeans. But the tyranny of their masters ought rather to inspire abhorrence of the colour. Besides, the black men and women of our colonies express the same tastes that our peasantry at home do, for stuffs of lively and glaring colours. Their supreme luxury in dress is a red handkerchief tied round the head. Nature has bestowed no other tints on the roses of Africa than upon those of Europe.

If the judgement of black slaves is considered as a suspicious authority, on the subject, we may refer the decisions to the Sovereigns of Africa, who are under no temptation to dissemble. They fairly acknowledge that in this, as well as in many other respects, they have been more hardly dealt with than the Europeans. African Princes have made frequent application to the Governors of the English, Dutch, and French settlements on the coast for white women, under a promise of very ample privileges in return. *Lamb*, an English agent at Ardra, when prisoner to the King of Dahomay, in the year 1724, sent word to the Governor of the English fort of Juida, that if he could send a white woman, or even a mulatto, to this Prince, she might acquire an unbounded influence over his mind. (*General History of Voyages, by the Abbé Prevost.* Book viii. page 96).

of the Earth, there is nothing so beautiful as a handsome man, nothing so shocking as a very ugly one.

This

Another King, on a different part of the coast of Africa, promised one day to a Capuchin Missionary, who was preaching the Gospel in his presence, to dismiss his seraglio, and embrace Christianity, if he would procure him a white woman to wife. The zealous Missionary immediately repaired to the nearest Portuguese settlement; and having enquired whether there might not be among them some pure and virtuous damsel, such as might suit his purpose, he was informed of such a person, the niece of a decayed man of family, who lived in a state of great privacy. He waited for her one Sunday morning at the door of the church, as she was returning from mass with her kinsman; and addressing himself to the uncle before all the people, charged him, in the name of God, and as he valued the interests of religion, that he would bestow his niece in marriage on the Negro King. The gentleman and his niece having given their consent, the black Prince married her, after having dismissed all his other women, and received public baptism. *(History of Ethiopia, by Labat.)*

The best informed travellers relate many such anecdotes of a similar preference expressed by the black Sovereigns of Africa, and of southern Asia. *Thomas Rowe*, Ambassador from England at the Court of the Mogul *Selim-Scha*, relates, that a very cordial reception was given by this powerful Monarch to certain Portuguese Jesuits, who had come as missionaries into his dominions, with a view to obtain, through their means, some women of their country to recruit his seraglio. He began with conferring on them singular privileges; had apartments provided for them in the vicinity of his palace, and admitted them to his most intimate familiarity: but perceiving that those good fathers discovered no great inclination to gratify his desires, he practised a very ingenious artifice to draw them into compliance. He expressed an extreme partiality to the Christian Religion; and pretending that he was restrained merely by reasons of State from openly embracing it, he gave strict orders to two of his nephews to attend punctually on the catechetical instructions of the missionaries. When the young men

This farther suggests a reason why it will be for ever impossible for art to produce a perfect imitation of the human figure, from the difficulty of uniting

men had acquired a competent degree of knowledge, he enjoined them to get themselves baptized, and this being complied with, he thus addressed them: "It is now no longer in your power to "marry pagan women, and of this country; for you have made "profession of Christianity. It is the duty of the fathers who "baptized you to procure you wives. Tell them they must send "to Portugal for women to be your brides." The young proselytes did not fail to make this demand on the good fathers, who suspecting that the Mogul's real intention, in marrying his nephews to Portuguese wives, was to procure a supply of white women for his seraglio, refused to engage in this negociation. Their refusal highly incensed *Selim Scha*, and exposed them to much persecution: he immediately commanded his nephews to renounce Christianity. *(Memoirs of Thomas Rowe, Thevenot's Collection.)*

The black colour of the skin is, as we shall presently see, a blessing from Heaven to the Nations of the South, because it absorbs the reflexes of the burning Sun under which they live. But the men of those Nations do not the less on that account consider white women as more beautiful than the black, for the same reason that they think the day more beautiful, than the night, because the harmonies of colours and of lights render themselves perceptible in the complexion of the whites, whereas they almost entirely disappear in that of the blacks, who can pretend to no competition with the others in point of beauty, except as to form and stature.

The proportions of the human figure having been taken, as we have just seen, from the most beautiful forms of Nature, are become in their turn models of beauty for Man. If we attend to this, we shall find that the forms which please us most in works of art, as those of antique vases, and the relations of height and breadth in monuments, have been taken from the human figure. It is well known that the Ionic column, with it's capital and it's flutings, was imitated after the shape, the head-dress, and the drapery of the Grecian young women.

in it all the harmonies; and from the still greater difficulty of effecting a complete combination of those which are of a different nature. For example, the Painter may succeed tolerably in imitating the colours of the face, and the Sculptor in expressing it's forms. But were an attempt made to unite the harmony of colours and of forms in a single bust, such a production will be very inferior to a mere picture, or to a mere piece of sculpture, because it will combine particular dissonances of colours and of forms, besides their general dissonance, which is still more strongly marked. If to these it were farther attempted to add the harmony of movements, as in the case of an automaton, this would only aggravate the incongruity. Were art to continue it's effort, and try to bestow the gift of speech likewise, this must produce a fourth dissonance, which would be absolutely hideous; for here the intellectual system would clash frightfully with the physical system. It is accordingly matter of no surprize to me that St. *Thomas Aquinas* was so shocked at the speaking head, in constructing which, his master *Albert the Great* had employed so many years, that under the influence of horror he instantly broke it to shivers. It must have produced on him the same impression which he would have felt had he heard an articulate voice issuing out of a dead man's mouth. Such labours in general do the Artist much honour; but they demonstrate the weakness of Art, which falls below Nature just in proportion as it aims at uniting more of her harmonies. Instead of blending them, as Nature herself does, Art can only place them in opposition.

All

All this proves the truth of the principle which we have laid down, namely, that harmony results from the union of two contraries, and discord from their collision: and the more agreeable that the harmonies of an object are, the more disgusting are it's discordances. This is the real origin of pleasure and of dislike in physics as in morals, and the reason why the same object so frequently excites affection and aversion.

A great variety of very interesting reflections remain to be made on the human figure, especially by connecting with it the moral sensations, which alone give expression to the features. We shall introduce some of these in the sequel of this Work, when we come to speak of sentiment. Be it as it may, the physical beauty of Man is so striking in the eyes even of the animal creation, that to it principally must be ascribed the empire which he exercises over them in every part of the Earth. The feeble flee for refuge under his protection, and the most powerful tremble at sight of him. *Mathiola* relates, that the lark will save herself amidst troops of men when she perceives the bird of prey hovering over her. The reality of this instinct was confirmed to me by an officer who was once an eye-witness of one in such circumstances, fleeing for safety among a very distinguished squadron of cavalry in which he then served; but the trooper whose particular protection she sought, trampled her to death under his horse's feet; a most barbarous action, which drew on him, and justly, the indignation of every good man in the corps.

I myself have seen a stag, when run down by the

hounds, appeal with sobs for relief to the compassion of persons accidentally passing that way. *Pliny* relates a similar fact, and it is consistent with my own experience when I was in the Isle of France, which I have detailed in the journal of my Voyage to that Island. I have seen in the farm yards the India-hens, under the impulse of love, go and throw themselves chuckling at the feet of the country-people. If we meet less frequently with instances of the effect of animal confidence in Man, it is because of the noise of our fowling-pieces scaring them incessantly, and of the continual other persecutions which they are doomed to undergo.

It is well known with what familiarity the monkeys, and fowls of all kinds, approach travellers in the forests of India.* I have seen at the Cape of Good-Hope, in Cape-town itself, the shores of the Sea swarming with water-fowls, which perched confidently on the shallops, and a large wild pelican playing close by the custom-house with a great dog, whose head she took into her enormous beak. This spectacle conveyed to me from the moment of my arrival, a most powerful impression in favour of the happiness of that country, and of the humanity of it's inhabitants: nor did my conjecture deceive me.

But dangerous animals on the contrary are seized with terror at the sight of Man, unless they be driven from their natural bias by some pressing necessity. An elephant will suffer himself to be led about in Asia by a little child. The African lion retires growling from the cabin of the Hottentot; surren-

* See *Bernier* and *Mandelslo*.

ders

ders up to him the possessions of his ancestors, and seeks for himself a kingdom far remote, in forests and among rocks untrodden by the foot of Man. The immense whale, amidst his native element, trembles and flees away before the puny bark of the Laplander. And thus to this day is executed that all potent Law which secured empire to Man, though sunk into guilt and wretchedness: "And the fear of you, and "the dread of you, shall be upon every beast of the "earth, and upon every fowl of the air; upon all that "moveth upon the earth, and upon all the fishes of "the sea; into your hand are they delivered."*

It is singularly remarkable, that through the whole extent of Nature there is no animal whatever, nor plant, nor fossil, nor even globe, but what has it's consonance and it's contrast out of itself, Man excepted. No one visible being enters into society with him but either as his servant or as his slave.

We must undoubtedly reckon among the human proportions that Law so universal, and so wonderful, which produces males and females in equal numbers. Did chance preside over the generation of the human race as over our alliances, we should one year have an unmixed crop of male children, and another a race entirely female. Some nations would consists wholly of men, and others wholly of women; but all over the Globe the two sexes are born, within the same space of time, equal in number. A consonance so regular clearly demonstrates that a Providence is continually watching over the affairs of Mankind, notwithstanding the absurdity and disorder of human

* Genesis, chap. ix. ver. 2.

institutions. This may be considered as a standing testimony to the truth of our Religion, which likewise limits Man to one Woman in Marriage, and, by this conformity to natural Laws peculiar to itself, seems alone to have emanated from the AUTHOR of Nature. It may fairly be concluded on the contrary, that a religion which permits or connives at a plurality of wives must be erroneous.

Ah! how little acquainted are they with the Laws of Nature, who in the union of the two sexes, look for nothing farther than the pleasures of sense! They are only culling the flowers of life, without once tasting of it's fruit. The fair sex! this is the phrase of our men of pleasure; women are known to them under no other idea. But the sex is fair only to persons who have no other faculty except that of eyesight. It is besides, to those who have a heart, the creative sex, which at the peril of life carries Man for nine months in the womb; and the cherishing sex, which suckles and tends him in infancy. It is the pious sex, which conducts him to the altar while he is yet a child, and teaches him to draw in, with the milk of the maternal breast, the love of a religion which the cruel policy of men would frequently render odious to him. It is the pacific sex, which sheds not the blood of a fellow-creature; the sympathizing sex, which ministers to the sick, and handles without hurting them.

To no purpose does Man pretend to boast of his power and his strength; if his robust hands are able to subdue iron and brass, those of the woman, more dextrous and more usefully employed, can spin into threads

threads the flax and the fleeces of the sheep. The one encounters gloomy care with the maxims of philosophy; the other banishes it by sportiveness and gaiety. The one opposes to external evils the force of his reason; the other far happier, eludes them, by the mobility of her's. If the man sometimes considers it as his glory to bid defiance to danger in the field of battle, the woman triumphs in calmly meeting dangers more inevitable, and frequently more cruel, on her bed and under the banners of pleasure. Thus they have been created to support together the ills of life, and to form by their union the most powerful of consonances and the sweetest of contrasts.

I am obliged by the plan of my Work to proceed, and to refrain from pursuing my reflections on subjects so interesting as the marriage and the beauty of Man and Woman. I must however hazard some farther observations extracted from my store, in order to induce others to dive into this rich mine, with the additional value of novelty.

All Philosophers who have made Man their particular study are agreed, and with good reason, that he is the most wretched of all animals. Most of them appear to have been sensible that an associate was necessary to him to relieve his burthens, and they have made his happiness in part to consist of friendship. This is an evident demonstration of human weakness and misery; for were man naturally strong he would stand in no need of either associate or assistance. Elephants and lions live solitary in the forests. They need no friends, because Nature has made them strong.

It

It is very remarkable that when the Ancients give us a representation of perfect friendship, it is always restricted to two, whatever may be the extent of human weakness; for man is frequently reduced to the necessity of deriving his felicity from the concurring interposition of many beings similar to himself. Several reasons may be assigned for this restriction, the principal of which are deducible from the nature of the human heart, which from it's very weakness is capable of attaching itself to only one object at once; and which being compounded of opposite passions that maintain a perpetual counterpoise, is in some sense both active and passive, and stands in need of loving and of being beloved, of comforting and of being comforted, of honouring and of being honoured, and so on. Accordingly all the friendships celebrated in the historic page existed only between two persons; such as those of *Castor* and *Pollux;* of *Theseus* and *Perithoüs*, of *Hercules* and *Iolas*; of *Orestes* and *Pylades;* of *Alexander* and *Hephestion*, and many others.

It is farther to be remarked that those singular friendships have ever been associated with virtuous and heroic actions; but whenever the union comprehended more persons than two, it was speedily dissolved by discord, or if permitted to subsist for any length of time, became famous only for the mischief which it brought on Mankind: such was that of the triumvirate among the Romans. In cases when the associates in such alliances were still more numerous, the mischief which they did was always in proportion to the greatness of the number of which they consisted.

sisted. Thus the tyranny of the Decemviri at Rome exhibited a violence still more cruel than that of the Triumviri, for it spread destruction, we may venture to say, without passion and in cold blood.

There are likewise triummillvirates and decemmillvirates: these are your various descriptions of Corps. With good reason have they obtained the appellation of *Corps*; for they frequently have a centre distinct from their Country, of which they ought only to be members. They have likewise views distinct from those of their Country, a distinct ambition and distinct interests. They are with relation to the rest of the citizens, inconstant, detached, destitute of an object, and frequently destitute also of the spirit of patriotism: they are that, in a word, which regular troops are with relation to light troops. They will not suffer them to appear in an avenue along which they themselves are advancing, and dispossess them of the posts which they may have occupied the whole length of their route. How many revolutions have been effected in Russia by the Strelitzes; in Rome by the Pretorian guards; at Constantinople by the Janizaries; and elsewhere by Corps still more political? Thus, by a just re-action of Providence, the spirit of Corps has been as fatal to Countries as the spirit of Country has itself been to Mankind.

If the heart of Man admits of but a single object, what judgment shall we form of our modern friendships, embracing as they do such a multiplicity? Undoubtedly if a man has thirty friends, he can bestow on each of them only the thirtieth part of his affection, and can receive in return no greatear proportion of

of theirs. He must of necessity therefore deceive them; for no one is disposed to be a friend by fractions.

But if the truth may be told, such friendships are merely confederacies of ambition; relations interested and purely political, employed entirely in practising mutual illusion, in the view of aggrandizing themselves at the expense of society; and which would be productive of unspeakable mischief, were they more closely united among themselves, and unless they are counterbalanced by opposite confederacies. Almost all our general associations accordingly issue in intestine wars. On the other hand, I do not speak of the inconveniencies which result from particular unions rather too intimate. The most celebrated friendships of Antiquity have not been in this respect wholly exempt from suspicion, though I am persuaded they were as virtuous as the persons who were the objects of them.

The AUTHOR of Nature has given to each of us in our own species a natural friend, completely adapted to all the demands of human life, capable of supplying all the affections of the heart, and all the restlessness of temperament. He says from the beginning of the World: "It is not good that the man should "be alone: I will make him an help meet for him; "—and the LORD GOD made Woman, and brought "her unto the Man."* Woman pleases all our senses by her form and by her graces. She has in her character every thing that can interest the heart of Man, and at every stage of human life. She merits by the long and painful solicitudes which she

* Genesis, chap. ii. ver. 18, 22.

exercises

exercises over our infancy, our respect as a mother, and our gratitude as a nurse; afterward as Man advances to youth, she attracts all his love as a mistress; and in the maturity of manhood, all his tenderness as a wife, his confidence as a faithful steward, his protection as being feeble; and even in old age she merits our highest consideration as the source of posterity, and our intimacy as a friend who has been the companion of our good and bad fortune through life. Her gaiety, nay her very caprices, balance, at all seasons, the gravity and the over-reflective constancy of Man, and acquire reciprocally a preponderancy over him.

Thus the defects of the one sex and the excess of the other are in exact mutual compensation. They are formed, if I may use the expression, to be grooved into each other, like the corresponding pieces of carpenters-work, the prominent and retreating parts of which constitute a vessel fit to launch on the stormy ocean of life, and to attain additional strength from the very buffetings of the tempest. Had we not been informed by a sacred tradition, that Woman was extracted from the side of Man, and though this great truth were not every day manifested in the wonderful birth of the children of the two sexes in equal numbers, we should be speedily instructed in it by our wants. Man without the Woman and Woman without the Man, are imperfect beings, in the order of Nature. But the greater contrast there is in their characters, the more complete union there is in their harmonies. It is, as we have already briefly hinted, from their oppositions in talents, in tastes, in fortunes, that the most intense and the most durable affection

affection is produced. Marriage is therefore the friendship of Nature, and the only real union which is not exposed, like those which exist among men, to estrangement, to rivalship, to jealousies, and to the changes which time is effecting in our inclinations.

But wherefore are there so few happy marriages among us? I answer, because with us the sexes have divested themselves each of it's proper nature, and assumed the other. It is because the women with us adopt the manners of men from education; and men the manners of women from habit. The women have been despoiled of the graces and of the talents peculiar to their sex, by the masters, the sciences, the customs, the occupations of men. There is no way left save one, but that is infallible, to bring both back to Nature; it is to inspire them with a taste for Religion. By Religion, I do not mean attachment to ceremonies, or systems of Theology; but the religion of the heart, pure, simple, unostentatious; such as it is so beautifully depicted in the Gospel.

Religion will restore to the two sexes not only their moral character, but their physical beauty. It is not climate, it is not aliment, it is not bodily exercise, nor all these together which form human beauty; it is the moral sentiment of virtue, which cannot subsist independently of Religion. Aliment and exercise no doubt contribute greatly to the magnitude and the expansion of the body; but they have no manner of influence on the beauty of the face, which is the true physionomy of the soul. It is by no means uncommon to see persons tall and robust disgustingly ugly; with the stature of a giant and the face of a monkey.

Beauty

Beauty of face is to such a degree the expression of the harmonies of the soul, that in every country those classes of citizens who are, from their condition, obliged to live with others in a state of constraint, are sensibly the homeliest of the society. The truth of this observation may be ascertained, particularly among the noblesse of many of our provinces, who live with each other in the perpetual jealousy of rank, and with their neighbours of an inferior order in a state of unremitting hostility, for the maintenance of their prerogatives. Most of those Nobles present a complexion bilious and parched. They are meagre, sulky, and perceptibly uglier than the other inhabitants of the same district, though they breathe the same air, live on the same aliments, and in general enjoy a superior degree of fortune. Accordingly, they are far from being gentlemen both in name and in fact. Nay, there is a Nation bordering upon ours, the subjects of which are as much celebrated all over Europe for their pride as for their homeliness. All those men are rendered hard favoured from the same causes that most of our children degenerate in look; who, however amiable in early life, become ugly on going to college, from the miseries and irksomeness of these institutions. I say nothing of their natural character, which undergoes the same revolution with their physionomy; this last being always a consequence of the other.

The same thing does not hold good respecting the noblesse of some other of our provincial districts, and the nobility of other parts of Europe. These living as they do, in good understanding among themselves, and

and with their compatriots, are in general the handsomest men of their Nation, because their social and benevolent spirit is not in a state of incessant constraint and anxiety.

To the same moral causes may be referred the beauty of the features of the Greek and Roman physionomies, where we generally meet with models so exquisite in their statues and medallions. They were beautiful, because they were happy; they lived in cordial union with their equals, and in the enjoyment of popular favour with the citizens at large. Besides, there were among them no melancholy, moping, monkish institutions, similar to those of our colleges, contrived to disfigure the whole youth of a Nation at once. The descendants of those same Nations are at this day far from exhibiting a resemblance to their ancestors, though the climate of their country is not in the smallest degree changed.

It is farther to moral causes that we must refer the singularly dignified physionomies of the great Lords of the Court of *Louis* XIV. as is visible in their portraits. In general, persons of quality being by their rank elevated above the rest of the Nation, do not live continually at daggers drawing with each other, and with the other subjects of the State, as is the case of most of our small country-gentlemen. Besides they are usually educated under the paternal roof, that is, under the blessed influence of domestic enjoyment, and far remote from jealousy and strife. But those of the age of *Louis* XIV. had this distinguished advantage over their posterity, that they were taught to value themselves on beneficence, and popular

popular affability, and on bestowing their patronage upon talents and virtue wherever they found them. There is not, perhaps, a great family of that period, but what has the honour to boast of having brought forward and raised into distinction, some one man of obscure birth, or of the inferior Nobility, who afterwards rendered himself illustrious, by means of such support, in arts, in literature, in the church, or in the army.

These grandees acted thus, in imitation of the Sovereign, or perhaps from a remainder of the spirit of the magnificence of the feudal government, which then expired. Be this as it may, they were handsome, because they were contented and happy; and this noble emotion of soul toward beneficence, has impressed on their physionomy a majestic character, which will ever distinguish them from the men of preceding ages, and still more from that which has succeeded.

Observations of this kind are not an object of curiosity merely: they are of much more importance than is generally apprehended; for it follows as a necessary consequence, that in order to form in a Nation beautiful children, and of course handsome men, in both the physical and moral sense of the word, it is not necessary, according to the doctrine of certain medical men, to subject the human species to regular purgation, and under particular aspects of the Moon. Children restricted to a rigid regimen of this sort, as are most of those of our Physicians and Apothecaries, all present wan pasteboard figures; and when grown up, pale complexions and bilious temperaments like their fathers.

In order to render children beautiful, you must render them physically, but above all morally happy. You must prevent every possible occasion of vexation to them, not by kindling in their breasts dangerous and headstrong passions, as in the case of spoiled children, but on the contrary by teaching them to curb such as they have from Nature, and which society is ever excitinginto a state of fermentation; and especially by guarding against the communication of every thing unnatutal, such as useless and irksome tasks, emulations, rivalship, and the like.....But we shall resume this important subject at greater length hereafter.

The ugliness of a child is to be imputed, in almost every case, to his nurse or to his preceptor. I have sometimes observed among so many classes of society more or less disfigured by our institutions, some families singularly beautiful. On enquiring into the cause of this, I have found that those families, though of the commonalty, were happier in a moral respect than those of other citizens; that the mothers had suckled their own children; that the young people had learned their occupations under the paternal roof and inspection; that they have been treated with much tenderness and indulgence; that their parents were fondly attached to each other; that they all lived together, notwithstanding the hardships of their low condition, in a state of liberty and cordiality, which rendered them good, happy, and satisfied.

I have thence deduced this other consequence: That we frequently make a false estimate of the happiness of human life. On seeing here a Gardener with

with the port of a Roman Emperor; and there a great Lord with the mask of a slave, I imagined at first that Nature had committed a mistake. But experience demonstrates, that the great Lord in question is, from the hour of his birth to that of his death, placed in a series of positions, which permit him not to gratify his own inclination three times a year. For he is under the necessity, from his infancy upward, to do the will, first of his preceptors and masters; in more advanced life, that of his prince, of ministers of state, of his rivals, nay frequently that of his enemies. Thus he finds fetters innumerable in his very dignities. Our Gardener, on the other hand, passes his whole life without being exposed to the slightest contradiction. Like the Centurion in the Gospel, he says to his servant, Come, and he cometh; and to another, Do this, and he doeth it This demonstrates that Providence has assigned to our very passions a part widely different from that which society presents to them, for in cases innumerable the most unrelenting slavery is imposed, together with an accumulation of honours; and in the meanest of human conditions we frequently find the possession of the most unbounded empire.

Besides, persons who have been disfigured by the corruptive impression of vicious education and habits have it in their power to reform their looks; and I say this principally for the sake of our females, who in order to gain this point, apply white and red, and patch up faces, like those of dolls, utterly destitute of character. After all they are in the right; for it is much better to conceal character altogether, than to

exhibit that of the cruel passions which are often preying upon them; especially to the eyes of so many of the other sex, who study character merely to take the advantage of it. There are infallible means in their power of acquiring a beauty altogether irresistible. It is to be internally good, gentle, compassionate, sensible, beneficent, and devout. These affections of a virtuous soul will impress on their features characters altogether celestial, which will appear beautiful even to the farthest extremity of old age.

Nay, I will venture so far as to affirm, that the harsher the traits may be in homely persons who have suffered degradation from a faulty education, the more sublime and impressive will be the contrasts produced in them by those which they acquire from habits of virtue; for when we find goodness under an unpromising exterior, we are as agreeably suprized as at finding violets and primroses under a shrubbery of briars and thorns. Such was the sensation inspired on a first introduction to the crabbed-looking M. *de Turenne;* and such in our days is that which we feel at the first aspect of a certain northern Prince, as justly celebrated for his goodness, as the King his brother has rendered himself by his victories. I have no doubt that the repelling outside of these two great men may have greatly contributed to give a peculiar prominency to the excellence of their heart. Such too was the beauty of *Socrates*, who, with the features of a profligate, delighted every eye while he discoursed of virtue.

But to no purpose will a man attempt to decorate his countenance with the indications of good qualities

lities to which his heart is a stranger. This false beauty produces an effect still more disgusting than the most decided ugliness; for when, attracted by an apparent goodness, we actually find dishonesty and perfidy, we are seized with horror, as when we find a serpent lurking in a bed of flowers. Such is the detestable character generally ascribed to courtiers.

Moral beauty then is that after which we are bound to aspire, that it's divine irradiations may be diffused over our features and over our actions. To no purpose will a Prince himself make his boast of high birth, riches, credit, wit; the People in order to know him must look him in the face. The People form their judgment of him entirely from the physionomy; it is in every country the first, and frequently the last letter of recommendation.

OF CONCERTS.

Concert is an order formed of several harmonies of various kinds. It differs from simple order in this, that the last is frequently nothing but a series of harmonies of the same species.

Every particular Work of Nature presents, in different kinds, harmonies, consonances, contrasts; and forms a real concert. This we shall more amply unfold in the study which treats of plants. It may henceforward be considered as a well-founded remark on the subject of those harmonies, and of those contrasts, that vegetables whose flowers have the least lustre are frequented by animals of the most brilliant colours; and on the contrary, that the vegetables which are most highly coloured serve as an

asylum to the duskiest animals. This is particularly evident in countries situated between the Tropics; where the trees and herbage, which have few if any apparent flowers, lodge and support birds, insects, nay monkies, of the most lively colours. It is in the plains of India that the peacock displays his gaudy plumage, on a shrubbery despoiled of verdure by the burning heat of the sun. In the same climate it is that the parrot race, consisting of so many different species, enamelled with a thousand various colours, perch on the gray bough of the palm tree, and that clouds of little paroquets, green as the emerald, alight on fields embrowned by the lengthened heats of Summer.

In our temperate regions, on the contrary, most of our birds are dull-coloured, because most of our vegetables have flowers and fruits with shining colours. It is very remarkable, that such of our birds and insects as have lively colours usually choose for their habitation vegetables that have no apparent flowers. Thus the heath-cock glisters on the gray verdure of the pine, whose apples serve him for food. The goldfinch builds his nest in the rough fullers-thistle. The most beautiful of our caterpillars, which is marbled with scarlet, is to be found on a species of the tithymal that usually grows in the sands, and amidst the quarries of the forest of Fontainbleau. On the contrary, our birds of dusky hue inhabit shrubbery with gay-coloured flowers. The black-headed bullfinch builds his nest in the white-thorn, and that lovely bird exhibits farther most agreeable consonance and contrast with the prickly shrub where he resides, by his blood stained

stained breast and the sweetness of his song. The nightingale with brown plumage delights to nestle in the rose-bush, according to the traditions of the oriential Poets, who have founded many a charming fable on the loves of that melancholy bird for the rose.

I could here exhibit a multitude of other harmonies of a similar nature, respecting the animals both of our own and of foreign countries. I have collected these to a very considerable number; but I acknowledge they are too incomplete to admit of my forming of them the entire concert of one plant. I shall however treat the subject more at large under the article of vegetables. It will be sufficient at present to produce a single example, which incontestably proves the existence of those harmonic Laws of Nature: it is this, that they subsist even in places not exposed to the view of the Sun. We always find in the cells of the mole fragments of the bulbous root of the colchica close by the nest of her young. Now let any one examine the plants which usually grow in our meadows, and he will find none which forms more harmonies and contrasts with the black colour of the mole, than the white, impurpled, and lilach flowers of the colchica. This plant likewise furnishes powerful means of defence to the feeble mole against her natural enemy the dog, who is continually hunting after her in the meadows; for he is poisoned if he eats it. For this reason the colchica has obtained the trivial name of dog-bane. The mole then finds a supply of food for her necessities, and a protection against her enemies, in the colchica, as the

bullfinch does in the white-thorn. Such harmonies are not only very agreeable objects of speculation, but may be turned to very good practical account; for from what has just been suggested it will follow, that if you wish to allure the bull-finch to your shrubbery, you have only to plant the white-thorn; and if you would clear your grounds of the mole, exterminate the bulbs of the colchica.

If to each plant are added it's elementary harmonies, such as those of the season when it appears; of the soil and situation in which it vegetates; the effects of the dews, and of the reflexes of the light on it's foliage: the movements which it undergoes from the action of the winds; it's contrasts and consonances with other plants, and with the quadrupeds, the birds, and the insects, which are peculiar to it; and you will perceive a delightful concert formed all around, the harmonies of which are still unknown to us. It is only however by pursuing this track, that we shall be enabled to obtain a glimpse of the immense and magnificent edifice of Nature. I would earnestly intreat Naturalists, persons fond of gardening, Painters, nay Poets likewise, thus to prosecute their studies, and to take frequent draughts from this perennial spring of taste and of delight. They will behold new worlds arising into view, and with out removing from their own Horizon, they will make discoveries infinitely more curious than those which are contained in our books and cabinets, where the productions of the Universe are frittered away and disjoined in the petty drawers of our mechanical systems.

I know

I know not at present what name I ought to give to the conformities which those particular concerts have with Man. Certain it undoubtedly is, that there is no Work of Nature but what strengthens it's particular concert, or if you will it's natural character, by the habitation of Man; and which does not communicate in it's turn to the habitation of Man, some expression of grandeur, of gaiety, of terror, or of majesty. There is no verdant mead but what is rendered more cheerful by a dance of shepherdesses and their swains; and no tempest but what acquires additional horror from the shipwreck of a vessel. Nature raises the physical character of her Works to a sublime moral character, by collecting them around mankind. This is not the place to descant at large on the new order of sentiments hereby suggested. I satisfy myself at present with observing, That she not only employs particular concerts to express in detail the characters of her Works, but when she means to express these same characters on the great scale, she combines a multitude of harmonies and of contrasts of the same kind, in order to form of them one great general concert, which has only a single expression, let the field of representation be ever so extensive.

Thus, for example, in order to express the maleficent character of a venomous plant, she combines in it clashing oppositions of the forms and colours which are the indications of that maleficence; such as retreating and bristly forms, livid colours, dark greens, with white and black spots, virulent smells....But when she means to characterize a whole district that is

is unwholesome, she collects a multitude of similar dissonances. The air is loaded with thick fogs, the turbid waters exhale only nauseous smells, no vegetable thrives on the putrid soil but such as are disgusting, the dracunculus, for instance, the flower of which exhibits the form, the colour, and the smell of an ulcer. If any tree arises in the cloudy atmosphere, it is the yew only, whose red and smoky trunk has the appearance of having passeed through the fire, and whose gloomy foliage serves as an asylum only to owls. if any other animal is to be found seeking a retreat under it's lurid shade, it is the blood-coloured centipede, or the toad crawling along the humid and rotten ground. By these, or similar signs, Nature scares Man away from noxious situations.

If she intends to give him at sea the signal of an impending tempest; as she has opposed in ferocious animals the fiery glare of the eyes to the thickness of the eye-brows; the stripes and spots with which they are marked to the yellow colour of their skin, and the stillness of their movements to the thundering noise of their voices; she collects in like manner in the sky, and on the deep, a multitude of clashing oppositions, which in concert announce approaching devastation. Dark clouds sweep through the air in the horrible forms of dragons. Here and there the pale fire of lightning bursts from the gloom; the noise of the thunder, with which their dark womb is impregnated, resounds like the roaring of the celestial lion. The Orb of Day, who can scarcely render himself visible through their rainy and multiplied veils, emits long radiations of a wan and sickly light.

light. The leaden surface of the Ocean sinks and swells into broad white foaming surges. A hollow murmuring noise seems to issue from those threatening billows. The black shallows whiten at a distance, with horrid sounds, from time to time interrupted by ominous silence. The Sea, which alternately covers and reveals them, displays to the light of day their cavernous foundations. The Norwegian lom perches on one of their craggy points, uttering lamentable cries, like those of a drowning man. The sea-ospray rises aloft in the air, and not daring to commit herself to the impetuosity of the winds, struggles with a plaintive screaming voice against the tempest which bends back her stubborn wings. The black procellaria flutters about, grazing the foam of the waves, and seeks in the cavity of their moving valleys a shelter from the fury of the winds. If this small and feeble bird happens to perceive a ship in the midst of the Sea, he flees for refuge along her side, and as a reward for the protection which he solicits, announces the tempest to the mariner before it overtakes him.

Nature uniformly proportions the signs of destruction to the magnitude of the danger. Thus, for example, the signs of tempest off the Cape of Good-Hope far exceed those on our coasts. The celebrated *Vernet*, who has exhibited so many terrifying representations of the Sea, is far from having depicted all the horrors of the watery element. Every storm has it's peculiar character, and in every particular latitude. Far different are the storms off the Cape of Good-Hope from those off Cape Horn; those of the

the Baltic from those of the Mediterranean; those on the banks of Newfoundland from those on the coast of Africa. They farther differ according to the season of the year, and even according to the hour of the day. Those of Summer are very unlike those of Winter; and widely different is the spectacle of an enraged sea, shining at noon-day under the rays of the Sun, and that of the same sea illuminated at the midnight hour by a single flash of lightning. But you perceive in all the clashing oppositions of which I have made mention.

I have remarked one thing in the tempests off the Cape of Good-Hope, which strikingly supports all that I have hitherto advanced respecting the principles of discord and harmony; and which may perhaps suggest profound and useful reflection to some one of greater ability than I can pretend to. It is this, That Nature frequently accompanies the signs of the disorder which agitates the Ocean with agreeable expressions of harmony, that serve only to redouble the horror of the scene.

Thus, for example, in two different storms to which I was exposed in those seas, I did not see the face of Heaven obscured by dark clouds, nor these clouds furrowed by alternate flashes of lightning, nor a sea muddy and lead-coloured, as in the tempests of our climates. The sky, on the contrary, presented a fine blue, and the sea a beautiful azure; there were no other clouds hovering in the air but small aggregations of a ruddy vapour, dark toward the centre, and illuminated about the extremities with the yellow lustre of burnished brass. They took their depar-

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ture from a single point in the Horizon, and travelled across the Heavens with the rapidity of a bird flying. When the thunder shivered in pieces our main-mast in the middle of the night, it did not roll; and emitted only a crack resembling that of a cannon shot off close by us. Two other thunder claps which had preceeded this one, were exactly similar. This was in the month of June, which is mid-winter at the Cape of Good-Hope.

I was caught in another storm when doubling the Cape, on my return in the month of January, which is midsummer in that part of the world. The ground of the Heavens was blue, as in the first, and not above five or six clouds were perceptible above the Horizon; but each of them white, black, cavernous, and of an enormous magnitude, resembled a portion of the Alps suspended in the air. This last was much less violent than the former, with its small ruddy vapours. In both the sea was of the same beautiful azure colour with the sky; and on the curling crests of the vast billows, rushinglikeso many cascades, were formed bright coloured rainbows.

These tempests, in the full blaze of light, are inexpressibly tremendous. The soul stands aghast at sight of the indications of tranquillity converted into signs of storm; the unclouded azure in the Heavens, and the rainbow playing upon the waves. The principles of harmony appeared to be completely inverted. Nature seemed to have put on a character of perfidiousness, and to conceal fury under the mask of benevolence.

The shallows of those Latitudes exhibit similar contrasts.

contrasts. *John Hugo de Linschoten*, who saw those of the Jewess at no great distance, in the Mosambique channel, and upon which he was in extreme danger of making shipwreck, informs us, that they have a most hideous aspect, being black, white, and green. Thus Nature increases the characters of terror, by intermingling with them certain agreeable expressions.

There is a farther observation of esssential importance to be made in this place; namely, That in those awful scenes of danger and affright, the terrible is close upon you, and the agreeable is removed to an immense distance; tumult is in the seas, and serenity in the sky. A prodigious extension is thus given to the sentiment of disorder; for there is no apparent boundary set to tempests of this sort. All depends on the first impulsion which we undergo. The sentiment of infinity that is within us, and which is ever making new efforts to propagate itself farther and farther, seeks to make it's escape from the physical evil wherewith it is surrounded; but repelled in some sort by the serenity of the treacherous Horizon, falls back upon itself and undergoes a severer pang, under the pressure of present painful affections, because their source has the appearance of being invariable.

Such is the Giant of Storms, stationed by Nature at the entrance of the Seas of India, and so well delineated by the pencil of *Camoëns*. Nature in our climates produces quite contrary effects; for during Winter she redoubles our repose within doors, by covering the face of Heaven with dark and rainy clouds. All depends, as I have just said, on the first impulsion

impulsion which the soul receives. *Lucretius* is undoubtedly right in saying, that our pleasure and security on shore are greatly increased by the sight of a storm at sea.

A Painter accordingly, who wished to strengthen in a picture the effect of a beautiful landscape, and the felicity of it's inhabitants, would only have to represent in the back-ground a vessel at the mercy of the winds and of the raging deep: the happiness of the shepherds would in this case be powerfully heightened by contrast with the distress of the mariners. But if it were his intention, on the contrary, to augment the horrors of a tempest, it would be necessary for him to place in opposition to the distress of the mariners, the felicity of the shepherds; and, for this effect, the vessel must be introduced between the spectator and the landscape. The first sentiment depends on the first impulsion; and the ground contrasting with the scene is so far from being a deviation from Nature, that the leading object is impressed with additional energy by being thrown back upon itself. Thus it is possible, with the same objects placed differently, to produce directly opposite effects.

If Nature, by introducing certain agreeable harmonies into scenes of discord, redoubles their confusion, such as the green colour of the rocks of the Jewess, or the azure in the tempests off the Cape, she frequently throws in a discordance, in concerts the most delightful, for the purpose of heightening the pleasurable effect. Thus a noisy water-fall precipitating itself into a tranquil valley, or a rugged

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and dusky rock ascending in the midst of a verdant plain, enhances the beauty of a landscape. Thus a mole on a beautiful face gives it additional vivacity. Skilful Artists have sometimes happily imitated those harmonic contrasts. *Callot*, when he intended to aggravate the horror of his infernal scenery, introduced amidst his demons the head of a fine woman on the carcase of an animal. On the contrary, the most renowned Grecian Painters, in order to render *Venus* more interesting, represented her with a slight squint in her eyes.

Nature employs offensive contrasts only for the purpose of chasing Man away from some perilous situation. In all the rest of her Works she employs only harmonic mediums. I must not involve myself in the examination of their different concerts; it is a subject whose riches are inexhaustible. All that could be expected from my scanty fund was the indication of a few of their principles. I shall endeavour, however, to trace a slight sketch of the manner in which she harmonizes the common fields of our harvests, these being the production of human agriculture, seem abandoned to the monotony that characterizes most of the works of Man.

First of all, it is remarkable that we here find that charming shade of green, produced by the alliance of the two primordial opposite colours, which are the yellow and the blue. This harmonic colour decompounds itself in it's turn by another metamorphosis, towards the time of the harvest, into the three primordial colours, namely, the yellow of the ripening corn, the red of the wild poppy, and the azure of the blue-

blue-bottle. These two plants are found intermingled with the standing corn all over Europe, let the farmer take what pains he may in sifting the grain and in weeding his field. They form by their harmony a very rich purple tint, which rises admirably on the yellow ground of the corn-field.

If you study these two plants separately, you will find between them a variety of particular contrasts; for the blue-bottle has narrow and slender leaves; but those of the poppy are broad, with deep incisions. The blue-bottle has the corolla of it's flowers radiating, and of a delicate azure; but those of the poppy are large, and of a deep red. The blue-bottle throws out divergent stalks; but those of the poppy are straight. We find, besides, among the corn, the cockle or corn-rose, which rises to the height of the expanded ear, with handsome purple flowers in form of a trumpet; and the convolvulus with a flesh-coloured flower, crawling up along the reeds, and surrounding them with verdure like a thyrsus. There is a great variety of other vegetables usually to be found growing among corn, and forming contrasts the most agreeable, most of them exhale the sweetest perfumes; and when agitated by the Summer's breeze, you would be disposed from their undulations to imagine the whole a sea of verdure enamelled with flowers. Add to all the rest a gentle rustling of the ears against each other, most agreeably soothing, which by it's soft murmuring sound invites to sleep.

These lovely forests of vegetable beauty are not destitute of inhabitants. You see bustling about un-

der their shade, the green-coated scarab, streaked with gold, and the monoceros of the colour of burnt coffee. This last insect takes delight in a hillock of horse-dung, and is furnished with a ploughshare on his head, with which he removes the ground like a labourer. There are besides a variety of charming contrasts in the bees and the butterflies, which are attracted by the flowers of the corn-field, and in the manners of the birds which inhabit them. The far-travelled swallow is continually skimming along their surface, undulating like the waters of a lake; whereas the stationary lark towers above them in a perpendicular direction, within sight of her nest. The domesticated partridge and transitory quail, there find a situation equally favourable to both for rearing their young. The hare frequently burrows in their neighbourhoood, and quietly nibbles the wild thistle.

These animals have with Man relations of utility, from their fruitfulness and their furs. It is remarkable that they are to be found over all the corn-districts of Europe, and that their species are varied according to all the variety of human habitation; for there are different species of quails, partridges, larks, swallows, and hares, adapted to the plains, to the mountains, to the heaths, to the meadows, to the forests, and to the rocks.

As to the corn-plant itself, it has relations innumerable with the wants of Man and of his domestic animals. It is neither too high nor too low for his stature. It is easily handled and reaped. It furnishes grain to his poultry, bran to his pigs, forage and litter to his black cattle and his horses. Every

plant

plant that grows in his corn-field possesses virtues particularly adapted to the maladies incident to the condition of the labouring-man. The poppy is a cure for the pleurisy; it procures sleep; it stops hemorrhages and spitting of blood. The blue-bottle is a diuretic; it is vulnerary, cordial and cooling; it is an antidote to the stings of venomous insects, and a remedy for inflammation of the eyes. Thus the husbandman finds all needful pharmacy in the field which he cultivates.

The culture of this staff of life discloses to him many other agreeable concerts with his fleeting existence. The direction of it's shadow informs him of the hour of the day; from it's progressive growth he learns the rapid flight of the seasons: he reckons the flux of his own fugitive years by the successions of the guiltless harvests which he has reaped. He is haunted with no apprehension, like the inhabitants of great cities, of conjugal infidelity, or of a too numerous posterity. His labours are always surpassed by the benefits of Nature. When the Sun gets to the sign of Virgo, he summons his kindred, he invites his neighbours, and marches at their head by the dawning of the day, with sickle in hand, to the ripened field. His heart exults with joy as he binds up the swelling sheaves, while his children dance around them, crowned with garlands of blue-bottles and wild poppies. The harmless play recalls to his memory the amusements of his own early days, and of his virtuous ancestors, whom he hopes at length to rejoin in a better and happier World. The sight of his copious harvest demonstrates to him that there is

a GOD; and every return of that joyous season, bringing to his recollection the delicious eras of his past existence, inspires him with gratitude to the Great Being who has united the transient society of men by an eternal chain of blessings.

Ye flowery meadows, ye majestic, murmuring forests, ye mossy fountains, ye desert rocks, frequented by the dove alone, ye enchanting solitudes, which charm by your ineffable concerts; happy is the man who shall be permitted to unveil your hidden beauties! but still happier far is he who shall have in his power calmly to enjoy them in the inheritance of his forefathers!

OF SOME OTHER LAWS OF NATURE HITHERTO IMPERFECTLY KNOWN.

There are, besides those which have been mentioned, some physical Laws not hitherto profoundly investigated, though we have had a glimmering of them, and made them the frequent subject of conversation. Such is the Law of attraction. It has been acknowledged in the planets, and in some metals, as in iron and the load-stone, in gold and mercury. I believe attraction to be common to all metals, and even to all fossils; but that it acts in each of them in particular circumstances, which have not hitherto been observed and ascertained. Each of the metals, perhaps, may have a disposition to turn toward different parts of the Earth, as magnetic iron points toward the North, and toward places where there are mines of iron. It would probably be necessary, in order to ascertain this by experiment, that each metal should be

bearmed with it's proper attraction; this takes place, as I think, when it is united to it's contrary.

How do we know whether a needle of gold, rubbed with mercury, might not have attractive poles, as a needle of steel has when rubbed with the magnet? Thus prepared, or in some other way adapted to it's nature, it might possibly indicate the places which contain mines of that rich metal. Perhaps it might determine the general points of direction to the East or to the West, which might serve as an indication of the Longitudes more steadily than the variations of the magnetic needle.

If there be a point at the Pole on which the Globe seems to revolve there may possibly be one under the Equator from which it's rotatory motion has commenced, and which may have determined it's motion of rotation. It is very remarkable, for example, that all seas are filled with univalve shell-fish, of an infinity of very different species, which all have their surrounding spirals in an increasing progression, and in one and the same direction, that is from left to right like the motion of the Globe, when the mouth of the shell is turned northward, with the base to the ground. There is only a very small number of species which may be considered as exceptions, and which have, for this very reason, been denomidated *unique* (singular or extraordinary). The spirals of these circulate from right to left.

A direction so general and exceptions so particular in univalve shell-fish, undoubtedly have their causes in Nature, and their epochas in the unknown ages when their germs were created. It is impossible

that they should proceed from the actual influence of the Sun, who acts on them in a thousand different aspects. Can they have been thus directed in a conformity to some general Current of the Ocean, or to some unknown attraction of the Earth, toward the North or the South, toward the East or the West? These relations will appear strange, and perhaps frivolous to our men of Science; but every thing in Nature is a series of concatenation. A slight observation here in many cases leads to important discovery. A small plate of iron turning toward the North guides a whole Navy through the deserts of the Ocean; and a reed of an unknown species, thrown on the coast of the Azores, suggested to *Christopher Columbus* the existence of a western World.

Whatever may be in this, certain it is that there exists a great number of those particular points of attraction scattered over the Earth, such as the matrices which renovate the mines of metals by attracting to themselves the metallic parts dispersed in the elements. It is by means of attractive matrices that those mines are inexhaustible, as has been remarked in many places, among others in the Isle of Elba situated in the Mediterranean. This little island is entirely a mine of iron, from which had been already extracted, in the time of *Pliny*, an immense quantity of that metal, without it's being perceptible as he tells us, that it was in the smallest degree diminished. Metals have besides other attractions; and if I might presume to deliver my opinion by the way, I consider these themselves as the principal matrices

trices of all fossil bodies, and as the ever active means employed by Nature for repairing the mountains and the rocks, which the action of the other elements, but especially the injudicious labours of men, have an incessant tendency to impair.

I shall here remark on the subject of mines of gold, that they are placed, as well as those of all metals, not only on the most elevated part of Continents, but in icy mountains.

The celebrated gold mines of Peru and of Chili are it is well known in the Cordeliers. The gold mines of Mexico are situated in the vicinity of Mount St. Martha, which is covered with snow all the year round. The rivers of Europe, which wash down particles of gold along their shores, issue from icy mountains. The Po in Italy has it's source in those of Piedmont. But without quitting France, we reckon ten greater or smaller rivers which roll along gold dust intermingled with their sands, and which have all of them their origin in mountains of ice. Such is the Rhine from Strasburg to Philipsburg; the Rhone in the Païs de Gex; the Doux in Franche-Comte; which three all take their rise in the icy mountains of Switzerland. The Cese and the Gardon descend from those of the Cevennes. The Ariege in the Païs de Foix; the Garonne in the vicinity of Thoulouse; the Salat in the Country of Conserans; and the rivulets of Ferriet and Benagues all take their rise in the icy mountains of the Pyrennées.

This observation may be extended, I believe, to all the gold mines in the World, even to those of Africa,

such of whose rivers as wash down the greatest quantities of gold dust, the Senegal for instance, descend from the mountains of the Moon.

To this it might be objected, that gold was formerly found in Europe, in places where there were no icy mountains; nay, that some has been picked up on the surface of the ground, as in Brasil; and not many years ago that there was found an ingot, or mass of several pounds weight, on the bank of a river in the district of Cinaloa, in New-Mexico. But if I might venture to hazard a conjecture respecting the origin of this gold, scattered about on the surface of the earth, in the ancient Continent of Europe, and especially in that of the New World, I believe it to have proceeded from the total effusions of the ices of the mountains which took place at the time of the Deluge; and that as the spoils of the Ocean covered the western parts of Europe, that those of vegetable earths were spread over the eastern part of Asia, those of minerals from the mountains were forced along other countries, where their fragments were found in the earlier ages, in grains, and even in larger masses.

This much is certain, that when *Christopher Columbus* discovered the Lucayo and Antilles islands, he found among those islanders abundance of gold of a base alloy, the produce of the traffic which they had carried on with the inhabitants of the Continent; but they had no mines within their own territory, notwithstanding the prejudice then entertained, and under which many labour to this day, that the Sun formed this precious metal in the earth of the Torrid

Torrid Zone. For my own part, I find as I have just observed, gold much more common in the vicinity of icy mountains, whatever their Latitude may be; and I conjecture from analogy, that there must be very rich mines of it in the North. It is extremely probable, that the waters of the Deluge hurled along considerable portions of that metal to the northern countries.

We read, I think, in the Book of Job the Arabian, this remarkable expression; "Gold cometh from the "North"* Certain it is, that the first commerce of India with Europe was carried on by the North, as has been clearly demonstrated by the Baron *de Stralenberg*, a Swedish exile, after the battle of Pultowa, in Siberia, of which he has given a very sensible and accurate description. He says, that it is still possible to pursue, by evident traces, the track of the ancient Indians along the river of Petzora, which empties itself into the White Sea. On it's banks in various places are found many of their tombs, which contain some of them manuscripts on silk stuffs, in the language of *Thibet;* and there are perceptible on the rocks along it's shores, characters which they have

* This is not entirely of a piece with our Author's usual accuracy. It is written indeed in the Book of Job. chap. xxxvii. ver. 9, "*Cold* cometh ou of the North:" and ver 22. "*Fair weather* cometh out of the North;" but no where in Scripture, so far as I know is this affirmed of *Gold*. *St. Pierre* seems to have quoted from general and indistinct recollection; happy no doubt to have, as he thought, a text from the Bible to support his conjecture. But, notwithstanding this defect, his reasoning is plausible and the human testimony which he adduces respectable.

H. H.

have traced upon them in a red which cannot be effaced. From this river they forced their way through the lakes, by means of leather boats, to the Baltic; or coasted along the northern and western shores of Europe.

This track was known to the Indians even from the time of the ancient Romans; for *Cornelius Nepos* relates, that a King of the Suevi made a present to *Metellus Celer* of two Indians, who had been thrown by stress of weather, with their leathern canoe, on the coast adjacent to the mouth of the Elbe. It is not easy to conceive what those Indians, the inhabitants of a warm country, were going in quest of so far to the North. What use could they have made in India of the furs of Siberia? It would appear they went thither in search of gold, which might then be frequently discoverable to the North at the surface of the earth.

Whatever may be in this, it is presumable that, as mines of gold are placed in the most elevated regions of the Continent, their matrices collect in the Atmosphere the volatilized particles of gold, which ascend thither with the fossil and aquatic emanations, conveyed by the winds from every quarter. But they exercise over men attractions still much more powerful.

It would appear as if Nature by burying the focuses of this rich metal under the snows, had intended to fence it with ramparts still more inaccessible than the flinty bosom of the rock, lest the undismayed ardor of human avarice should at length destroy them entirely. It has become the most powerful bond of

of Society, and the perpetual object of all the labours of a life so rapidly hurrying to a close. Alas! were Nature at this day to inflict condign punishment on this insatiable thirst in the Nations of Europe, for a metal so useless as a real necessary of human life, she has only to change the territory of some one of them into gold. Every other nation would instantly flock thither, and in a little time exterminate it's wretched inhabitants. The Peruvians and Mexicans have had the dreadful experience of this.

There are metals not so highly prized but much more useful, the elementary attractions of which might perhaps procure us very important accommodations.

The peaks of the mountains and their lengthened crests, are filled, as we have seen, with iron or copper, intermingled with a vitreous body of granite, or of natural crystal, which attracts the rains and the stormy clouds like so many real and electric needles. There is not a seaman but what has a thousand times seen those peaks and those crests covered with a cloudy cap, gathered round and round, and concealing them entirely from view, without once suspecting the cause of this appearance. Our Philosophers, on the other hand, deducing their conclusions merely from the inspection of charts, have taken those rocky protuberances for the wrecks of a primitive earth without giving themselves any trouble about their effects.

They ought to have observed, that those metallic pyramids and crests, as well as most mines of iron and copper, are always to be found in elevated situations,

and

and at the source of all rivers, of which they are the primitive causes by means of their attractions. Their general inattention to this subject is thus only to be accounted for; seamen observe, and do not reason; and the learned reason, but do not observe. Undoubtedly had the experience of the one been united to the sagacity of the other, prodigies of discovery might have been expected.

I am persuaded that, in imitation of Nature, it might be possible for us to acquire the art of forming, by means of electric stones, artificial fountains, which should attract the rainy clouds in parched and dry situations, as chains and rods of iron attract thunder-clouds. It is true that Princes must be at the expense of such costly and useful experiments; but it is the way for them to immortalize their memory. The *Pharaohs*, who built the pyramids of Egypt, would not have drawn upon themselves the curses of their subjects, as *Pliny* assures us they did, for their enormous and useless labours, had they reared amidst the sands of Upper Egypt an electrical pyramid, which might there have formed an artificial fountain. The Arab who should resort thither at this day to quench his thirst, would still pronounce benedictions on names which, if we may believe the great Natural Historian, had already sunk into oblivion, and ceased to be mentioned in his time.

For my own part, I think that several metals might be proper for producing similar effects. An officer of high rank, in the service of the King of Prussia, informed me that having remarked vapours to be attracted by lead, he had employed it's attraction for drying

drying the atmosphere of a powder-magazine. This magazine was constructed under ground in the throat of a bastion, but had been rendered of no use whatever from it's humidity. He ordered to line with a coat of lead the concave ceiling of the arch, which was before planked over where the gun-powder was deposited in barrels: the vapours of the vault collected in great drops on the leaden roof, run off in streamlets along the sides, and left the gunpowder barrels perfectly dry.

It is to be presumed that every metal and every fossil has it's peculiar repulsion as well as it's attraction; for these two Laws always go hand in hand. Contraries seek out each other.

There are farther a multitude of other harmonic Laws as yet undiscovered; such are the proportions of magnitudes, and of the durations of existence, in beings vegetative and sensible, which differ exceedingly, though their nutriment and climates may be the same. Man, while yet a youth, sees the dog his companion and contemporary die of old age; and also the sheep which he fondled when a lamb. Though the former lived at his own table, and the other on the herbage of his meadow, neither the fidelity of the one nor the temperance of the other could prolong their days; whereas animals which live only on carrion and garbage live for ages, as the crow. It is impossible to guide ourselves in prosecuting such researches any other way than by following the spirit of conformity, which is the basis of our own reason, as it is that of the reason of Nature.

By consulting this we shall find, that if such and such

such a carnivorous animal is long-lived, as the crow for instance, it is because his services and his experience are long necessary for purifying the earth, in places whose impurities are incessantly renewing, and which are frequently at great distances from each other. If, on the contrary, an innocent animal lives but a little while, it is because his flesh and his skin are necessary to Man. If the domestic dog by his death frequently diffuses sorrow over the children of the family, whose intimate friend and fellow-boarder he was, Nature undoubtedly intended to give them, in the loss of an animal so worthy of the affections and the regret of the heart of Man, the first experience of the privations with which human life is to be exercised.

The duration of an animal's life is sometimes proportioned to the duration of the vegetable on which it feeds. A multitude of caterpillars are born and die with the leaves by which their transitory existence is supported. There are insects whose being is limited to five hours: such is the ephemera. This species of fly, about half as large as the tip of the little finger, is produced from a fluviatic grub which is found particularly at the mouths of rivers close by the water's edge, in the mud, into which it digs in quest of subsistence. This grub lives three years, and at the termination of that period, about Midsummer-day, it is transformed almost instantaneously into a fly, which comes into the world at six o'clock in the evening and dies about eleven at night. No longer space of time is necessary for copulation, and for depositing the eggs on the mud which the water has deserted.

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It is very remarkable that this insect copulates, and lays her eggs precisely at the time of the year when the tides are at the lowest, when the rivers discover at the place of their discharge the greatest part of their channel dry. Wings are then furnished, to enable her to go and deposit her eggs in places which the waters forsake, and to extend in the capacity of a fly the domain of her posterity, at the time when as a worm her territory is most contracted. I have likewise remarked, in the microscopic drawings and dissections given of this insect by the ingenious *Thevenot*, in the last part of his collection, that in her fly state she has neither interior nor exterior organs of nutrition. They would have been entirely useless to a life of such transient duration.

Nature has made nothing in vain. It is not credible that she should have created momentary lives, and beings infinitely minute, to fill up imaginary chains of existence. The Philosophers who ascribe to her these pretended plans of universality, which are destitute of every shadow of proof, and which make her descend into the infinitely small, for purposes equally frivolous, would represent her as acting somewhat like a mother, who gives as toys to amuse her children tiny coaches, and minute articles of household furniture of no use in the world, but which are imitations of domestic utensils.

The aversions and the instincts of animals emanate from Laws of a superior order, which we shall never be able to penetrate into in this world; but supposing those intimate conformities to elude our researches, they must be referred like every other to the general conformity

conformity of beings, and especially to that of Man. There is nothing so luminous in the study of Nature, as to refer every thing that exists to the goodness of GOD, and to the demands of humanity. This method of viewing objects not only discovers to us a multitude of unknown laws, but it sets bounds to those which we do know, and which we believe to be universal.

If Nature, for example, were governed by the Laws of attraction only, according to the supposition of those who have made it the basis of so many systems, every thing in the world would be in a state of rest. Bodies tending toward one common centre would there accumulate, and arrange themselves round it in the ratio of their gravity. The substances which compose the Globe would be so much heavier as they approached nearer to the centre, and those which are at the surface would all be reduced to a level. The bason of the Seas would be choked with the wrecks of the Land; and this magnificent architecture, formed of harmonies so various, would soon become an aquatic Globe entirely. All bodies hurled downward by one common precipitation, would be condemned to an everlasting immobility.

On the other hand, if the Law of projection, which is employed for explaining the motions of the heavenly bodies, on the supposition, that they have a tendency to fly off in the tangent of the curve which they desccibe; if, I say, this Law predominated, all bodies not actually adherent to the Earth would be hurled from it like stones from a sling: our Globe itself, subjected to this Law, would fly off from the Sun

Sun never to return. It would sometimes traverse in it's unbounded career the spaces of immensity, where no star would be perceptible during the course of many ages; sometimes swinging through regions where chance might have collected the matrices of Creation, it might pass along amidst the elementary parts of suns, aggregated by the central Laws of attraction, or scattered about in sparks and in rays by those of projection.

But on the supposition that these two contrary forces were combined happily enough in favour of the Globe, to fix it with it's vortex in the corner of the firmament, where these forces should act without destroying themselves, it would present it's Equator to the Sun with as much regularity as it describes it's annual course round him. From those two constant motions never could be produced that other motion so varied, by which it daily inclines one of it's Poles toward the Sun, till it's axis has formed on the plane of it's annual circle an angle of twenty-three degrees and an half; then that other retrograde motion, by which it presents to him with equal regularity the opposite Pole. Far from presenting to him alternately it's Poles, in order that his fertilizing heat may by turns melt their ices, it would retain them buried in eternal night and winter, with a part of the Temperate Zones, whereas the rest of it's circumference would be burnt up by the too constant fires of the Tropics.

But if we suppose, together with those constant Laws of attraction and projection, a third variable Law, which gives to the Earth the movement that

produces the seasons, and a fourth which gives it the diurnal motion of rotation round itself; and that no one of these Laws so opposite, should ever surpass the others, and at last determine it to obey but one single impulsion; it would be impossible to affirm that they had determined the forms and movements of the bodies which are on it's surface. First, the force of projection or centrifugal, would not have left upon it any one detached body. On the other hand, the force of attraction or gravity would not have permitted the mountains to rise, and still less the metals, which are the heaviest part of them, to be placed at their summits, where they are usually found.

If we suppose that those Laws are the *ultimatum* of chance, and that they are so combined as to form among themselves but one single Law; for the same reasons that they make the Earth move round the Sun, and the Moon round the Earth, they ought to act in the same manner on the particular bodies which are at the surface of the Globe. We ought to see the rocks detached, the fruits separated from the trees, the animals which are not provided with claws turning round it in the air, as we see the particles which compose *Saturn's* ring turn round that Planet.

It is the gravity, they repeat, which acts only at the surface of the Globe, that hinders bodies to detach themselves from it. But if it there absorbs the other powers, Wherefore, as we have already asked, did it permit the mountains to rise? How comes it that the centrifugal force should have been able to exalt to a prodigious height the long ridge of the Cordeliers, while

while it has left immovable the volatile scurf of snow which covers them? For what reason, if the action of gravity is still universal, has it no influence on the soft bodies of animals, when, shut up in the womb of the mother or in the egg, they are in a state of fluidity? All the numerous progeny of the Earth, animals and vegetables, ought to be rounded into balls like their mother. The weightiest parts of their bodies at least ought to be situated undermost, especially in those which possess self-motion; on the contrary they are frequently uppermost, and supported by limbs much lighter than the rest of the animal, as in the case of the horse and the ox. Sometimes they are between the head and the feet, as in the ostrich; or at the extremity of the body, in the head, as in the human species. Others, such as the tortoise, are flattened; others, such as reptiles, are drawn out of spindles; all of them, in a word, have forms infinitely varied.

Vegetables themselves, which seem entirely subjected to the action of the elements, have configurations diversified without end. But how comes it that animals have in themselves the principles of so many motions, so entirely different? Wherefore has not gravity nailed them down to the surface of the Earth? They ought to crawl along it at most. How comes it to pass, that the Laws which regulate the course of the Stars; those Laws whose influence has in modern times been made to extend even to the operations of the human soul, should permit the birds to rise into the air, and fly as they please to the West, to the North, to the South, notwithstanding the

united powers of the attraction, and of the projection of the Globe?

It is conformity, adaptation to use, which has regulated those Laws, and which has generalized or suspended their effects in subordination to the necessities of sensible beings. Though Nature employs an infinity of means, she permits Man to know only the end which she has in view. Her Works are subjected to rapid dissolutions; but she always suffers him to perceive the immortal consistency of her plans. It is on this she wishes to fix his heart and mind. She aims not at rendering Men ingenious and proud; her object is to render him good and happy. She universally mitigates the evils which are necessary; and universally multiplies blessings in many cases superfluous. In her harmonies, formed of contraries, she has opposed the empire of death to that of life; but life endures for a whole age, and death only an instant. She allows Man long to enjoy the expansions of beings so delightful to behold; but conceals from him, with a precaution truly maternal, their transient states of dissolution.

If an animal dies, if plants are decompounded in a morass, putrid emanations, and reptiles of a disgusting form, chase us away from them. An infinite number of secondary beings are created for the purpose of hastening forward the decompositions. If cavernous mountains and rocks present appearances of ruin; owls, birds of prey, the ferocious animals, which have made them their retreat, keep us at a distance from them. Nature drives far from us the spectacles and the ministers of destruction, and allures

us

us to her harmonies. She multiplies them in subserviency to our necessities, far beyond the Laws which she seems to have prescribed to herself, and beyond the measure which we had reason to expect. It is thus that the dry and barren rocks repeat by their echoes the murmuring sound of the waters and of the forests; and that the plane surfaces of the waters, which have neither forests nor hills, represent their colours and forms by reflecting them.

From a profusion of this unbounded benevolence of Nature it is, that the action of the Sun is multiplied wherever it was most necessary; and is mitigated in all the places where it should have been hurtful. First, the Sun is five or six days longer in our northern Hemisphere, because that Hemisphere contains the greatest part of the Continents, and is the most inhabited. His disk appears in it before he rises, and after he is set; which, added to it's twilights, considerably increases the natural length of our days. The colder that it is the farther does the refraction of his rays extend. This is the reason that it is greater in the morning than in the evening, in Winter than in Summer, and at the beginning of Spring than at the beginning of Autumn.

When the Orb of the Day has left us, during the night season, the Moon appears to reflect his light upon us, with varieties in her phases which have relations, hitherto unknown, to a great number of species of animals, and especially of fishes, which travel only in the night time, at the epochas which she indicates to them. The farther that the Sun withdraws from one Pole, the more are his rays re-

fracted there. But when he has entirely abandoned it, then it is that his light is supplied in a most wonderful manner. First, the Moon, by a movement altogether incomprehensible, goes to replace him there, and appears perpetually above the Horizon, without setting, as was observed in the year 1596, at Nova Zembla, by the unfortunate Dutchmen who wintered there, in the 76th degree of North Latitude.

It is in those dreadful climates that Nature multiplies her resources, in order to bestow on sensible beings the benefits of light and heat. The Heavens are there illuminated with the *aurora-borealis*, which darts up to the very zenith rays of moving light, gold-coloured, white, and red. The Poles sparkle with stars more luminous than those which appear in the rest of the firmament. The snows which cover the ground shelter part of the plants, and by their lustre dispel the darkness of night. The trees are clothed with thick mosses, which catch fire from the smallest spark; the very ground is covered with them, especially in the woods, to so great a depth, that I have oftener than once sunk in the Summer time up to the knees, in those of Russia: Finally, the animals which inhabit those regions are robed in fur to the very tip of their claws.

When the season returns for restoring heat to those climates, the Sun re-appears there a considerable time before his natural term. Thus, the Dutch mariners whom I have just mentioned, saw him to their astonishment above the Horizon of Nova Zembla, on the twenty-fourth of January, that is fifteen days sooner than they expected him. This return, so much earlier

lier than their hopes had fashioned it, filled them with joy, and disconcerted the calculations of their intelligent pilot, the unfortunate *Barents*.

It is then that the Star of Day there redoubles his heat and his light, by means of the parhelions, which like so many mirrors formed in the clouds reflect his disk upon the Earth. He calls from Africa the winds of the South, which passing over Zara, whose sands are then violently heated by the vicinity of the Sun to their zenith, load themselves with igneous particles, and proceed to attack like battering rams of fire, that tremendous cupola of ice which covers the extremity of our Hemisphere. It's enormous vaultage, dissolved by the heat of those winds and loosened by their violent agitations, detaches itself in fragments as lofty as mountains; and floating at the discretion of the Currents, which sweep them along toward the Line, they advance sometimes as far as to the 45th degree, cooling the Seas of the South by their vast effusions. Thus the ices of the Pole communicate coolness to the heated seas of Africa, just as the burning sands of Africa transmit warm winds to dissolve the ices of the Pole.

But as cold is in it's turn a very great blessing in the Torrid Zone, Nature employs a thousand methods to extend the influence of it in that Zone, and to mitigate in it the heat and the light of the Sun. First, she destroys there the refractions of the Atmosphere. There is scarcely any twilight between the Tropics to precede the rising of the Sun, and still less after his setting. When he is in the Zenith he veils himself with rainy clouds, which cool the ground

both by their shade and by their showers. Besides those clouds being frequently impregnated with thunder, the explosion of their fires dilates the superior stratum of the Atmosphere, which is icy at the height of two thousand five hundred fathom under the Line, as is evident from the snows which perpetually cover at that height the summits of some of the Cordelier mountains. They cause to flow down, by their explosions and concussions, columns of that air, congealed in the superior regions of the Atmosphere, into the inferior, which are suddenly cooled by it, as we feel it to be in our own climates in Summer, immediately after a thunder storm.

The effusions of the polar ices in like manner cool the seas of the South; and the polar winds frequently blow on the hottest parts of their shores. Nature has farther placed in the very heart of the Torrid Zone and in it's vicinity, chains of icy mountains, which accelerate and redouble the effects of the polar winds, especially along the seas, where fermentation was most to be dreaded, from the alluvions of the bodies of animals and of vegetables, which the waters are there continually depositing. Thus the chain of Mount Taurus, eternally covered with snow, commences in Africa, on the burning shores of Zara, and coasting the Mediterranean, passes on into Asia, where it extends long arms this way and that, which embrace the gulfs of the Indian Ocean. In America, in the same manner, the extensive chains of the Cordeliers of Peru and Chili, with the elevated ridges in which it crosses Brasil, cools the lengthened and burning shores of the South-Sea and of the gulf of Mexico.

These

These elementary dispositions are only part of the resources of Nature, for mitigating the heat in warm countries She there shades the ground with creeping vegetables and trees in form of a parasol, some of which, such as the cocoa-tree of the Sechelles islands and the talipot of Ceylon, have leaves from twelve to fifteen feet long, and from seven to eight feet broad. She clothes the animals of those regions with hairless skins, and colours them in general, as well as the verdure, with dark and dusky tints, in order to diminish the reflexes of the heat and of the light. This last consideration leads me here to suggest a few reflections on the effects of colours; the little which I shall advance on this subject will be sufficient to produce conviction that their generations are not the effect of chance; that it is from reasons profoundly wise we find one half of them proceed in compounding themselves toward the light; and in their decomposition toward darkness; and that all the harmonies of this World are produced by contraries.

Naturalists consider colours as accidents. But if we attend to the general uses for which Nature employs them, we shall be persuaded that there is not even on the rocks a single shade impressed without a meaning and a purpose. Let us observe, in the first place, the principal effects of the two extreme colours, white and black, with relation to the light. Experience demonstrates that of all colours, white is that which best reflects the rays of the Sun, because it sends them back without any tint, as pure as it receives them; and that black, on the contrary, is the least adapted to their reflection, because it absorbs them.

them. This is the reason why gardeners whiten the walls against which their espaliers are planted, in order to accelerate the maturity of their fruits, by the reverbation of the Sun's rays; and why opticians blacken the walls of the *camera-obscura*, that their reflexes may not disturb the luminous picture on the tablet.

Nature of consequence frequently employs to the North the white colour, in order to increase the light and heat of the Sun. Most of the lands there are whitish or of a clear gray. The rocks and sands of northern regions are filled with mica and specular particles. Farther, the whiteness of the snows which cover them in Winter, and the vitreous and crystalline particles of their ices, are exceedingly adapted to mitigate the action of the cold, by reflecting the light and heat in the most advantageous manner. The trunks of the birch trees, of which the greatest part of their forests consist, are covered with a bark as white as paper. Nay, in some places, the earth is clothed with a vegetation completely white.

"In the eastern part," says an intelligent Swede, "of the lofty mountains which separate Sweden from "Norway, exposed to the utmost rigour of the cold, "there is a very thick forest, and singular in this re- "spect, that the pine which grows there is rendered "black by a species of filamentous lichen, which "hangs upon it in great abundance; whereas the "ground is covered every where around with a "white lichen, which in lustre rivals the snow."*

* Extract from the Natural History of the rein-deer, by *Charles Frederick Hoffberg*, translated by M. le Chevalier de *Keralio*.

Nature

Nature there bestows the same colour on most animals, such as the white bear, the wolf, the partridge, the hare, the ermine; others perceptibly whiten to a certain degree in Winter, such as foxes and squirrels, which are reddish in Summer and light gray in Winter. Nay if we consider the filiform figure of their hair, it's varnish and transparency, we shall be sensible that it is contrived in the most proper manner for reflecting and refracting the rays of light. We ought not to imagine this whiteness as a degeneration or enfeebling of the animal, as Naturalists have done with respect to the human hair, which whitens in old age, as they tell us, from a failure of radical moisture; for nothing can be of a closer contexture than most of those furs, nor any thing more vigorous than the animals which are arrayed in them. The white-bear is one of the strongest and most formidable of animals in the world; it frequently requires several musket-shot to bring him down.

Nature, on the contrary, has tinged with red, with blue, with dusky and black tints, the soil, the vegetables, the animals, nay even the men, of the Torrid Zone, for the purpose of their absorbing the fires of the burning Atmosphere with which they are surrounded. The lands and the sands of the greatest part of Africa, situated between the Tropics, are of reddish brown, and the rocks are of a black hue. The Islands of France and of Bourbon, which are on the border of that Zone, are in general of the same dark complexion. I have seen there chickens and paraquets, not only whose plumage, but the skin itself was dyed black. I have likewise seen in those islands

fishes

fihses entirely black, and especially among the species which live near the surface of the water, over the shallows, such as the old-woman and the thornback.

As animals whiten in Winter toward the North in proportion as the Sun withdraws from them, those of the South assume dark and dusky tints, in proportion as the Sun approaches. When he is in the Zenith, the sparrows of the tropical countries have breast-plates, and the plumage of the head completely red. There are birds in those regions which change their colour three times every year, having, if I may use the expression, one dress for Spring, another for Summer, and a third for Winter, according as the Sun is in the Line, in the Tropic of Cancer, or in that of Capricorn.*

* The white colour accordingly increases the effect of the rays of the Sun, and the black weakens it. The inhabitants of Malta whiten the inside of their apartments, in order, as they allege, to render the scorpions perceptible, which are very common in that island. In doing this, if I am not mistaken, they commit two errors; the first, in misapprehending the colour: for the scorpions which there are gray, would appear still better on a dark ground; the second, and one of much greater importance, is their increasing to such a degree the reverberation of the light, that the eye-sight is sensibly affected by it. To this cause I principally ascribe the disorder of the eye so frequently complained of by those islanders. Our trades-people wear white hats in Summer, when in the Country, and complain of head-aches. All these evils arise from neglecting to study Nature. In the Isle of France they employ for wainscoting the wood of the country, which in time becomes entirely black; but this tint is two gloomy. It seems as if Nature had foreseen in this respect the services which Man was to derive from the interior of trees: their timber is brown in most of those hot countries, and white in those of the northern regions, such as the fir and the birch.

This

This too is very remarkable, and of consequential importance to the use which Nature makes of these colours to the North and to the South; namely, that in all countries the whitest part of an animal is the belly, because more heat is wanted there for promoting digestion, and for carrying on the other animal functions: and on the contrary the head is universally most strongly coloured, especially in those of hot countries, because in the animal economy that part stands most in need of being kept cool.

It cannot be maintained that the bellies of animals preserve their whiteness, because that part of the body is sheltered from the Sun; and that their heads assume strong colouring from being more exposed to his influence. It might appear from reasons of analogy that the natural effect of light ought to be, to invest with it's lustre all the objects which it touches; and that conformably to this the soil, the vegetables and the animals of the Torrid Zone ought to be white; and that darkness, on the contrary, acting for several months together on the Poles, ought to clothe every object within those regions in robes of mourning. But Nature subjects not herself to mechanical Laws. Whatever may be the physical effect of the presence of the Sun, or of his absence, she has contrived toward the North, to impose very black spots on the whitest bodies, and to the South, white spots on the darkest bodies. She has blackened the tip of the tail of the Siberian ermine, in order that these little animals which are white all over, as they march along the snow, where they scarcely leave any traces of their footsteps, may be enabled to distinguish

guish each other when proceeding in a train, in the luminous reflexes of the long nights of the North.

Perhaps too this blackness opposed to the white may be one of those decided characteristics with which she has marked beasts of prey; such as the extremity of the black snout and the black paws of the white bear. The ermine is a species of weazel. There are likewise in the North foxes completely black; but they are indemnified for the influence of the white colour by the warmest and thickest of furs; it is the most valuable of all those of the North. Besides this species of foxes is very rare even in those countries. Nature has perhaps clothed them in black because they live in subterraneous places, in the midst of warm sands, or in the vicinity of certain volcanos, or for some other reason to me unknown, but corresponding to their natural calls. It is thus she has clothed in white the palençu, or bird of the Tropics, because this fowl, which flies at a prodigious elevation above the Sea, passes part of it's life in the vicinity of a frozen Atmosphere. These exceptions by no means destroy the general adaptation of those two colours; on the contrary they confirm it, seeing it is employed by Nature for diminishing or increasing the heat of the animal, in conformity to the temperature of the place where it lives.

I now leave it to Naturalists to explain how it comes to pass that cold should cause to vegetate the hair of animals in the North; and why the heat should shorten or cause to fall off the hair of animals to the South; in contradiction to all the Laws

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of systematic, nay of experimental Physics; for we are assured from our personal experience that Winter retards the growth of the human hair and beard, and that the Summer accelerates it.

I believe I have a glimpse of a Law very different from the Law of analogies, which we so commonly assign to Nature, because it allies itself to our weakness by affording us a pretence to explain every thing, with the assistance of a small number of principles. This Law infinitely varied in it's means, is that of *compensations*.* It is a consequence from the universal

* In reflecting on these compensations, which are very numerous, and among others on those on the light of the Sun, which embrowns bodies in order to weaken the reflexes of them, it has suggested itself to my thoughts that fire must in like manner produce matter the best adapted to diminish it's own activity. And of this I have in fact made frequent proof, by throwing a little ashes on the flame blazing on my hearth. By this means I have been able to quench it suddenly almost without smoke. I recollect to this purpose having some time ago seen in one of our sea-ports, a great caldron full of pitch catch fire, which they were heating for careening a ship. Inexperienced persons immediately attempted to extinguish the flame by throwing water upon it; but the boiling and inflamed matter spread only the more violently in torrents of fire over the brim of the caldron; I did not think a single ladle-full would be left within the vessel, when an old seaman run up and instantly brought it down by throwing upon it a few shovels-full of ashes. I believe therefore that by uniting this application with that of water, great assistance might be derived in case of conflagrations; for the ashes would not only deaden the flame, without exciting that dreadful smoke which arises from it as soon as the engines begin to play, but when once thoroughly moistened they would retard the evaporation of the water, which is almost instantaneous when the fire has made a considerable progress. It would afford me

versal Law, or the mutual adaptation of things, and a sequel of the union of contraries, whereof the harmonies of the Universe are composed. Thus it frequently happens that effects so far from being the results of causes are opposite to them. For example, it has pleased Nature to clothe in white several birds, the inhabitants of warm regions, such as the heron of the Antilles, and the paroquet of the Moluccas, called *cacatoës*, but she has bestowed at the same time on their plumage a disposition which weakens the reflection of it.

Farther, it is very remarkable that she has furnished the heads of those birds with tufts and plumes of feathers which overshadow them, because, as was formerly observed, the head is that part of the body which in the animal economy stands most in need of being kept cool. Such is our crested hen, which comes originally from Numidia. Nay I do not believe that there are to be found in any but southern countries, birds with tufted heads. If there be some toward the North, as the lapwing, they make their appearance there only in Summer. Most of those of the North, on the contrary, have the belly and the feet clothed with tippets formed of down similar to the finest of wool.

This likewise is farther worthy of remark, respecting the white birds and quadrupeds of the South, which live in a hot Atmosphere, namely, if I am not mistaken, that the skin of them all is black;

me inexpressible satisfaction should this observation merit the attention of those who have ability to give it from their experience, sagacity and influence, all the utility of which it is susceptible.

which

which is sufficient to counterbalance the reflection of the colour of their exterior dress. *Robert Knox*, in speaking of certain white quadrupeds of the Island of Ceylon, says that their skin is entirely black. I myself recollect to have seen at Port l'Orient, a *cacatoës* whose stomach had been stripped of the feathers, and displayed a skin as black as that of a Negro. When this white bird with his black beak and black and naked breast, erected his plume and clapped his wings, he had the complete air of an Indian King with his crown and mantle of feathers.

This Law of compensations employs therefore means endlessly varied, which contradict most of the Laws which we have laid down in Physics; but this Law must itself be subjected to that of general accommodation or conformity; without which, were we to attempt to render it universal, it would involve us in the common error. It has given rise in Geometry to several axioms extremely doubtful; though of great celebrity, such as the following; *the action is equal to the re-action;* and this other, which is a consequence from it, *the angle of reflection is equal to the angle of incidence.* I shall not stop to demonstrate in how many cases these axioms are erroneous; how many actions in Nature are without re-actions; how many angles of reflection are deranged by the very planes of incidence. It is sufficient for me at present to repeat what I have already oftener than once advanced, namely, that the weakness of the human mind, and the vanity of our education, are incessantly prompting us to generalize. This mode of proceeding is the source of all our errors, and per-

haps of all our vices. Nature bestows on every being that which is adapted to it in the most perfect conformity, according to the Latitude for which it is destined; and when the temperature of that Latitude is affected by change of season, she is pleased to vary likewise the adaptations. Some of these adaptations are accordingly immutable, and others variable.

Nature frequently employs contrary means for producing the same effect. She makes glass with fire; she makes it too with water, crystal for instance: farther, she produces it from animal organization, such as certain transparent shell-fish. She forms the diamond by a process to us utterly unknown. Conclude now, because a body has been vitrified it must certainly be by the effect of fire, and rear on this perception the system of the universe! The utmost that we are capable of doing is to catch some harmonic instants in the existence of beings. That which is vitrifiable becomes calcareous, and what is calcareous changes into glass by the action of the same fire. Deduce then from these simple modifications of the fossil kingdom invariable characters for determining the general classes of it!

On the other hand. Nature frequently employs also the same means for producing effects directly contrary. For example, we have seen that in order to increase the heat over the lands of the North, and to mitigate it over those of the South, she made use of opposite colours; she produces in both the same effects by covering the face of the one and of the other with rocks. These rocks are essentially

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necessary to vegetation. I have frequently remarked in those of Finland stripes of verdure skirting their bases to the South ; and in those of the Isle of France I have seen such verdant stripes on the side averted from the Sun.

The same observations may be made in our own climate. In Summer when every thing is parched, we frequently find green herbage under walls which have a northerly aspect ; it disappears in Winter ; but then we find it replaced in front of eminences which face southward.

We have already remarked that the Icy Zones and the Torrid Zone contain the greatest quantity of waters, the evaporation of which equally tempers the violence of the heat and of the cold, with this difference, that the greatest lakes are toward the Poles, and the greatest rivers toward the Line. There are, it is admitted, some lakes in the interior of Africa and America ; but they are placed in elevated atmospheres in the centre of mountains, where they are not liable to corruption from the action of the heat ; but the plains and low grounds are washed by the greatest currents of living water that are in the World, such as the Zara, the Senegal, the Nile, the Mechassippi, the Oroonoko, the Amazon, and others.

Nature proposes to herself, universally, only the accommodation of beings possessed of sensibility. This remark is all-important in the study of her Works ; otherwise from the similitude of the means which she employs, or the exceptions from them, we might be tempted to doubt of the consistency of her Laws, in stead of ascribing the majestic obscurity which per-

vades them to the multiplicity of her resources, and to the profundity of our own ignorance.

This law of adaptation and conformity has been the source of all our discoveries. It was this which wafted *Christopher Columbus* to America; because, as *Herrera* tells us,* he thought, contrary to the opinion of the Ancients, that the whole five Zones must be inhabited, as GOD had not formed the Earth to be a desert. It is this Law which regulates our ideas respecting the objects absolutely beyond the reach of our examination. By means of it, though we are ignorant whether there may be men in the Planets, we are assured there must be eyes, because there is light. It is this which has awakened a sense of Justice in the heart of every man, and which informs him that there is another order of things after this life is at an end. This Law in a word is the most irresistible proof of the existence of GOD; for amidst such a multitude of adaptations, so ingenious that our passions themselves, restless as they are, never could have devised any thing similar; and so numerous, that every day is presenting to us some that have all the merit of novelty, the first of all, which is the DEITY, must undoubtedly exist, as he is the general conformity of all particular conformities.

It is this above all whose existence we endeavour even involuntarily every where to trace, and to assure ourselves of it in every possible manner. And this explains to us the reason why the most splendid and comprehensive collections in Natural History, Galleries of the choicest master-pieces in Painting, Gar-

* *Herrera's* History of the West-Indies. Book i. chap. 2.

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dens filled with the rarest and most curious plants, Libraries stored with the most valuable and best written books; in a word, every thing that presents to us the most marvellous relations of Nature, after having raised us to an extacy of admiration, conclude by superinducing langour and fatigue. We frequently prefer to all these a rustic mountain, a rugged rock, some wild solitude, which might present to us relations newer and still more direct.

How often on coming out of the King's magnificient Cabinet of Natural History do we stop mechanically to look at a gardener digging a hole in the field with his spade, or at a carpenter hewing a piece of timber with his hatchet? It looks as if we expected to see some new harmony start out of the bosom of the Earth, or burst from the side of a lump of oak. We set no value on those which we have just been enjoying, unless they lead us forward to others which as yet we do not know. But were the complete History given us of the stars of the Firmament, and of the invisible Planets which encircle them, we should perceive in them a multitude of ineffable plans of intelligence and goodness, after which the heart would continue fondly to sigh: it's last and only end is the DIVINITY himself.

STUDY ELEVENTH.

APPLICATION OF SOME GENERAL LAWS OF NATURE TO PLANTS.

BEFORE I proceed to speak of plants I must be indulged in making a few reflections on the language of Botany.

We are still so young in the study of Nature, that our languages are deficient in terms to express her most common harmonies. This is so true, that however exact the description of plants may be, and compiled by Botanists of whatever ability, it is impossible to distinguish them in the fields, unless you have previously seen them in Nature, or at least in a herbary. Persons who think they have made the greatest proficiency in Botany need only attempt to draw on paper a plant which they have never seen, after the description of the most accurate Master, to be convinced how widely the copy deviates from the original.

Men of genius have nevertheless taken inexpressible pains to assign characteristic names to the different parts of plants. They have even borrowed most of those names from the Greek, a language of singular energy of expression. From this has resulted another

another inconveniency; it is, that those names being for the most part compounds, cannot be rendered into modern language; and for this reason it is that a great part of the Works of *Linnæus* are absolutely incapable of translation. These learned and mysterious expressions no doubt diffuse a venerable air over the study of Botany; but Nature has no need of such resources of human art to attract our respect. The sublimity of her Laws can easily despense with the emphasis and obscurity of our expressions. The more light a man carries in his own bosom the more wonderful he esteems it to be.

After all, most of those foreign names employed particularly by the herd of Botanists, do not so much as express the most common characters of vegetables. They frequently make use, for example, of such vague expressions as these, *suavè rubente*, *suavè olente*, of an agreeable red, sweet smelling, in order to characterize flowers; without expressing the shade of red or the species of perfume. They are still more embarrassed when they wish to convey the dusky colours of the stem, of the root, or of the fruit; *atro-rubente*, say they *fusco-nigrescente*, of a dark red, of a dusky brown. As to the forms of vegetables, the case is still worse, though they have fabricated terms compounded of four or five Greek words to describe them.

J. J. Rousseau communicated to me one day a set of characters somewhat resembling the algebraic, which he had invented for the purpose of briefly expressing the colours and forms of vegetables. Some of them represented the forms of the flowers; others those of the leaves, others those of the fruits. Some

resembled a heart, some where triangular, some of the lozenge shape. He did not employ above nine or ten of those signs to compose the expression of one plant. Some he placed above others, with cyphers which indicated the genera and the species of the plant, so that you would have taken them for the terms of an algebraic formula. However ingenious and expeditious this method might be, he informed me that he had given it up because it presented to him skeletons only.

This sentiment came with peculiar grace from a man whose taste was equal to his genius, and may suggest some reflections to those who are for giving abridgments of every thing, especially of the Works of Nature. The idea of *John-James*, however, well deserves to be followed up, should it only serve to produce one day an alphabet proper to express the language of Nature. All that seems requisite is the introduction of accents to convey the shades of colours, and all the modifications of savours, perfumes, and forms. Even then those characters could not be delineated with perfect precision, unless the qualities of each vegetable were first exactly determined by words: otherwise the language of Botanists, which is now accused of speaking only to the ear, would make itself intelligible only to the eye.

This is what I have to propose respecting an object so highly interesting, and which will perfectly coalesce with the general principles which we shall afterwards lay down. The little which I may advance upon the subject will serve to supply expression, not only in Botany, and in the study of the other natural Sciences, but

but in all the Arts, where we find ourselves puzzled every instant for want of terms to convey the shades and forms of objects.

Though we have only the term *white* whereby to express the colour which bears that name, Nature presents to us a great variety of sorts of it. Painting with respect to this article is as barren as language.

I have been told of a famous painter of Italy, who upon a certain occasion found himself very much embarrassed how to represent in one of his pieces three figures dressed in white. The point in question was to give effect to those figures, to be thus uniformly dressed, and to draw out different shades of the most simple and the least compounded of all colours. He was going to abandon his object as a thing impossible, when happening to pass through a corn-market he perceived the effect which he was in quest of. It was a group formed by three millers, one of whom was under a tree, the second in the half tint of the shade of that tree, and the third exposed to the rays of the Sun: so that though the drapery of all the three was white, they were completely detached from each other. He introduced a tree therefore amidst the three personages of his picture, and by illuminating one of them with the rays of the Sun, and throwing over the other two different tints of shade, he was enabled to exhibit a drapery of three several casts of white.

This however was rather to elude the difficulty than to resolve it. And this is in fact what Painters do in similar cases. They diversify their whites by shades, half-tints, and reflexes; but these whites

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are not pure; they are always disturbed with yellow, blue, green, or gray. Nature employs several species of white without diminishing the purity of it, by dotting, rumpling, radiating, varnishing it, and in various other ways.....Thus the whites of the lily, of the daisy, of the lily-of-the-valley, of the narcissus, of the anemone-nemorosa, of the hyacinth, are all different from each other. The white of the daisy has something of that of a shepherdesses' cornet; that of the hyacinth has a resemblance of ivory; and that of the lily, half transparent and crystalline, resembles the paste of porcelain. I believe, therefore, that all the whites produced by Nature or by Art, might be referred to those of the petals of our flowers. We should thus have in vegetables a scale of shades of the purest white.

We might in like manner procure all the pure and imaginable shades of yellow, of red, and of blue, from the flowers of the jonquil, of the saffron, of the butter-flower of the meadow, of the rose, of the poppy, of the blue-bottle of the corn field, of the larkspur, and so on. We might find, in the same manner, among our common flowers, all the compound shades, such as those of the impurpled violet and foxglove, which are formed of the various harmonies of red and blue. The single compound colour, made up of blue and yellow, which constitutes the green of our herbage, is so varied in every plain, that each plant, I may venture to affirm, has it's peculiar shade of that colour. I can have no doubt that Nature has displayed in equal variety the other colours

colours of her palette, in the bosom of flowers, or on the surface of fruits.

In performing this she sometimes employs very different tints without confounding them; but she lays them on one above another, so that they form the dove's neck: such is the beautiful shag which garnishes the corolla of the anemone; in other cases she glazes their surface, as certain mosses with a green ground, which are glazed over with purple; she velvets others, such as the pansy, she powders over some fruits with a delicately fine flour, such as the purple plumb, distinguished by the addition of *de Monsieur*; or invests them with a light brown to soften their vermilion, as the peach; or smooths their skin, and gives the brightest lustre to their colours, as to the red of the apple of Calleville.

What embarrasses Naturalists the most in denominating colours, is to find distinctive epithets for such as are dusky; or rather, this gives them no manner of concern: for they evade the difficulty by the vague and indecisive expressions, of blackish, gray, ash-coloured, brown, which they convey, it is true, in Greek and Latin words. But those words frequently answer no purpose, except to confound their images, by giving no representation whatever; for what in good earnest is meant by these, and such like epithets, *atro-purpurante*, *fusco-nigrescente*, which they employ so frequently?

It is possible to make thousands of tints widely different from each other, to which such general expressions might be applied. As those dark shades in truth

truth are much compounded, it is exceedingly difficult to characterize them by the phraseology of our common vocabularies. But this might be easily and effectually accomplished, by referring them to the different colours of our domestic vegetables. I have remarked in the barks of our trees and shrubbery, in the capsules and shells of their fruits, as well as in the dead leaves, an incredible variety of those sad and gloomy shades, from yellow down to black, with all the intermixtures and accidents of the other colours. Thus, instead of saying in Latin a yellow inclining to black, or an ash-coloured tint, in order to determine some particular shade of colour in a production of Art or of Nature, we might say a yellow of the colour of a dried walnut, or a gray like the bark of a beech-tree.

Those expressions would be so much the more exact, that Nature invariably employs such tints in vegetables, as determining characters and indications of maturity, of vigor, or of decay; and that our peasantry can distinguish the different species of wood in the forests by the inspection of their bark simply. Thus, not Botany alone, but all the Arts might find in vegetables an inexhaustible dictionary of unvarying colours, which would not be embarrassed with barbarous and technical compound words, but which would continually present new images. Our books of Science would thence derive much pleasing vivacity, from being embellished by comparisons and expressions borrowed from the loveliest kingdom of Nature.

The great Poets of Antiquity carefully availed themselves

themselves of this, by referring most of the events of human life to some appearance of the vegetable kingdom. Thus *Homer* compares the fleeting generations of feeble mortals to the leaves which drop from the trees of the forest at the end of Autumn: the freshness of beauty to that of the rose; and the paleness which overspreads the countenance of a young man wounded to death in battle, as well as the attitude of his drooping head, to the colour and the fading of a lily, whose root has been torn up by the plough. But we satisfy ourselves with repeating the expressions of men of genius, without daring to tread in their footsteps. This however is not the worst, for most Naturalists consider the colours themselves of vegetables as accidents simply. We shall presently see under what a grievous mistake they labour, and how widely they have deviated from the sublime plans of Nature, by persisting in a prosecution of their mechanical and systematic methods.

It is possible in like manner to trace an approximation of savours and smells of every species, and of every country, to those of the plants of our gardens and of our fields. The ranunculus of the meadow has the acridity of the Java-pepper. The root of the caryophyllata, or holy thistle, and the flower of the pink, smell like the clove of Amboyna. As to compound savours and smells, they may be referred to such as are simple, the elements of which Nature has scattered over all climates, and which she has united in the class of vegetables. I know a species of morel used as food by the Indians, which when boiled has the taste of beef. They call it *brette*. There

There is a species of the crane's-bill, the leaf of which resembles in smell a roasted leg of mutton. The muscari, a species of small hyacinth, which grows among shrubbery early in the Spring, smells very strongly of the plumb. It's small monopetalous flowers, of a delicate blue colour and with lips or incisions, have likewise the form of that fruit.

By approximations such as these, the English Navigator *Dampier*, and Father *du Tertre*, have given us, as far as I can judge, the most accurate notions of the fruits and flowers which grow between the Tropics, by referring them to the fruits and flowers of our own climates. *Dampier*, for example, in order to describe the banana, compares it, when stripped of it's thick five-pannelled skin, to a large sausage; it's substance and colour to fresh butter in Winter; it's taste, a mixture of apple and of the pear known by the name of the good-christian, which melts in the mouth like marmalade. When this traveller describes some good fruit of the Indies, he sets your mouth a-watering. He possesses a naturally sound understanding, superior at once to the methodical trammels of the learned, and to the prejudices of the vulgar. He maintains, for instance, and with truth on his side, in opposition to the opinion of most navigators, that the plantain, or banana, is the king of fruits, without excepting even the cocoa. He informs us, that this is likewise the opinion of the Spaniards, and that multitudes of families live between the Tropics on this pleasant, wholesome, and nourishing fruit, which lasts all the year round, and stands in no need of any of the arts of cookery.

Father

Father *du Tertre* is not less happy nor less accurate in his botanical descriptions. These two travellers give you at a single stroke, by means of trivial similitudes, a precise idea of a foreign vegetable, which you would search for to no purpose in the Greek names of our first-rate Botanists. This mode of describing Nature, by ordinary images and sensations, is held in contempt by the learned; but I consider it as the only one capable of exhibiting pictures that have a resemblance, and as the true character of genius. With such assistance you will be enabled to paint every natural object, and may dispense with methods and systems; without it you will only coin phrases.

Let us now suggest a few thoughts respecting the form of natural objects. It is here that the language of Botany, and even those of the other Arts, are peculiarly barren. Geometry, whose particular object this is, has invented scarcely more than a dozen regular curves, which are known only to a small number of the learned; and Nature employs an infinite multitude of them in the forms of flowers alone. Some of the uses of these we shall presently indicate. Not that I mean to make of a study prolific of delight, a sublime Science, worthy only of the genius of a *Newton*. As Nature has introduced, in my opinion, not only the colours, the savours, and the perfumes, but likewise every model of form into the leaves, the flowers, and the fruits of all climates, whether in trees, in herbage, or in mosses; the vegetable forms of other parts of the World might be referred to those of our own country which are most familiar

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to us. Such approximations would be much more intelligible than the Greek compound words, and would manifest new relations in the different classes of the same kingdom.

They would be no less necessary for expressing the aggregations of the flowers on their stems, of the stems round the root, and the groups of young plants around the parent-plant. It may be affirmed, that the names of most of these vegetable aggregations and dispositions are yet to be invented; the greatest Masters not having been fortunate in characterizing them, or, to speak without reserve, not having made it any part of their study. For example, when *Tournefort** speaks, in his Voyage to the Levant, of a heliotrope of the Isle of Naxos, which he characterizes thus, *heliotropum humifusum, flore minimo, semine magno*, the creeping heliotrope, with a very small flower and a large seed; he says that it has it's flowers disposed in form of an ear of corn going off in a scorpion's tail. There are two mistakes in this description; for the flowers of this heliotrope, similar from their aggregation to the flowers of the heliotrope of our climates, and to that of Peru, are not disposed in form of an ear of corn, for they are arranged on a horizontal stem, and only on one side; and they bend downward like the tail of a snail, and not upward like the tail of a scorpion.

The same inaccuracy with respect of image is to be found in the description which he gives us of the *stachis Cretica latifolia*, the broad-leaved stachis of Crete: it's flowers, says he, are disposed in rings.

* *Tournefort's* Voyage to the Levant, vol. i.

No one can imagine he intends to convey this meaning, that they are disposed like the divisions of the king of the chess-board. Under this form however they are represented in the drawing of *Aubriet*, his designer. I do not know any botanic expression which conveys this character of spherical aggregations in separate stories of alternate swellings and sinkings, and terminating in a pyramid. *Barbeu du Bourg*, who possesses much imagination with little exactness, calls this form verticillate, for what reason I know not. If it is from the Latin word *vertex*, head or summit, because these flowers thus aggregated form several summits, this denomination would be more applicable to several other plants; and besides it does not express the swellings, the sinkings, and the progressive diminution of the flowers of the stachis.

Tournefort derives it from the Latin word *verticillus*; that is, says he, a small weight perforated circularly to receive the end of a spindle, in order to make it whirl with greater facility. This is going a great way in quest of a very imperfect similitude to an utensil by no means generally known. In saying this however, I would not be considered as failing in the respect which is due to such a man as *Tournefort*, who first cleared for us the botanic path, and was besides a person of profound erudition. But from this carelessness of the great Masters we may form a judgment of the vague, inaccurate, and incoherent expressions which fill the vocabulary of Botany, and diffuse obscurity over it's descriptions.

After all I shall be asked, How would you characterize the aggregation of the flowers of the two

plants which have just been mentioned? By referring them to aggregations similar to those of the plants of our own climates. In this there can be no difficulty: thus, for example, we might refer the assemblage of the flowers of the Grecian heliotrope to that of the French or Peruvian heliotrope; and that of the flowers of the Cretan stachis to that of the flowers of the horehound, or of the pennyroyal. To this might afterwards be added the differences in colour, smell, savour, which diversify the species of it. There is no occasion to compound foreign terms to describe forms which are familiar to us. Nay, I defy any one to convey by Greek and Latin words, and with the most learned turn of periphrasis, the simple colour of the bark of a tree. But if you tell me it resembles that of an oak, I have the shade of it at once.

These approximations of plants have this farther utility, that they present us with the combined whole of an unknown object, without which we can form no determinate idea of it. This is one of the defects of Botany, it exhibits the characters of vegetables only in succession; it does not collect them, it decompounds them. It refers them indeed to a classical order, but not to an individual order. This however is the only one which the human mind permits us to catch. We love order because we are feeble, and because the least confusion disturbs us; now there is no order which we can adopt more easily than that which approaches to an order which is familiar to us, and which Nature is every where presenting. Try to describe a man feature by feature, limb by limb; be ever so exact, yet you never will be able to give

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me his portrait: but if you refer him to some known personage; if you tell me, for example, that he is of the make and mean of a Don Quixote, or with a nose like that of St. *Charles Baromeo*, and so on, and you paint me his picture in four words. It is to the whole of an object that the ignorant, an epithet which includes the greatest part of Mankind, attach themselves in the first instance, in order to acquire the knowledge of it.

It would therefore be of essential importance to have, in Botany, an alphabet of colours, savours, smells, forms, and aggregations derived from our most common plants. Those elementary characters would enable us to express ourselves exactly in all the parts of Natural History, and to present to ourselves relations equally new and curious.

In hope that persons of superior intelligence may hereafter be induced to take up the subject, I proceed to the discussion of it with what ability I have, notwithstanding the embarrassment of language.

When we see a multitude of plants of different forms vegetate on the same soil, there is a disposition to believe that those of the same climate grow indifferently every where. But those only which are produced in places particularly assigned to them by Nature, attain there all the perfection of which they are susceptible. The same thing holds good with respect to animals. Goats are sometimes reared in marshy places, and ducks on the mountains; but the goat never will acquire in Holland the beauty of that which Nature clothes with silk on the rocks of Angora; nor will the duck of Angora ever attain the

stature and the colours of those which are to be found in the canals of Holland.

If we throw a simple glance on plants, we shall perceive that they have relations to the elements which promote their growth; that they have relations to each other, from the groups which they contribute to form; that they have relations to the animals which derive nourishment from them; and finally to Man, who is the centre of all the Works of Creation. To these relations I give the name of harmonies, and I divide them into elementary, into vegetable, into animal, and into human.

By proposing this division, I shall reduce to something like order the disquisition on which I am going to enter. It cannot be supposed that I should examine them in detail: those of a single species would furnish speculations which the application of a whole life could not exhaust; but I shall unfold enough of their general harmonies to produce conviction, that an infinite Intelligence reigns in this amiable part of Creation, as in the rest of the Universe.

We shall thus make application of the Laws which have been previously established, and shall take a glimpse of a multitude of others equally worthy of research, and equally calculated to excite admiration. Reader, be not astonished at either their number or their extent. Let this great truth be deeply impressed on thy heart: GOD *has made nothing in vain!* A scholar, with his systems and methods, finds himself stopped short in Nature every step he takes; while furnished with this as a key, the ignorant rustic is able to unlock every door of knowledge.

ELEMENTARY HARMONIES OF PLANTS.

Plants have as many principal parts as there are elements with which they keep up a relation. By their flowers they stand related to the Sun, which fecundates their seeds, and carries them on to maturity; by their leaves they are related to the waters which bedew them; by their stems, to the winds which agitate them; by their roots, with the ground which sustains them; and by their grains, with their situations adapted to their growth and increase. Not that these principal parts have no indirect relations besides to the other elements, but it will be sufficient for our purpose to dwell on such as are immediate.

Elementary Harmonies of Plants with the Sun, by the Flowers.

Though Botanists may have made great and laborious researches respecting plants, they have paid no attention to any of those relations. Fettered by their systems, they have attached themselves to the consideration of them particularly on the side of the flowers; and have arranged them in the same class, wherever they found these external resemblances, without so much as enquiring what might be the particular use of the florification. They have indeed distinguished in it the stamina, the antheræ, and the stigmata, for the fecundation of the fruit; but excepting this, and some others which respect the interior organization, they have neglected or misunderstood the relations which the whole plant has with the rest of Nature.

This partial division has led them into the strangest confusion; for by considering the flowers as the principal characters of vegetation, and by comprehending in the same class those which were similar, they have united plants entirely foreign to each other, and have separated, on the contrary, many which are evidently of the same genus. Such is, in the first case, the fullers-thistle, called *dipsacus*, which they class with the scabious, because of the resemblance of some parts of it's flower, though it presents in it's branches, it's leaves, it's smell, it's seed, it's prickles, and the rest of it's qualities, a real thistle: and such is, in the second, the great chestnut of India, which they exclude from the class of chestnut-trees because it has different flowers. To class plants from the flowers, that is, from the parts of their fecundation, is the same thing with classing animals from those of generation.

However, though they have referred the character of a plant to it's flower, they misunderstand the use of it's most shining part, which is that of the corolla. They call that the corolla, which is in common language denominated the leaves of a flower. It is a Latin word, signifying a little crown, from the disposition of the leaves in many species in the form of coronets, and they have given the name of petals to the divisions of that crown. Some in truth have acknowledged it to be properly adapted for covering the parts of fecundation before the expansion of the flower; but it's calix is much better adapted to this purpose, from it's thickness, from it's beards, and sometimes from the prickles with which it is invested.

Besides,

Besides, when the corolla leaves the stamina exposed, and when it continues fully blown for whole weeks, it must of necessity be answering some other purpose, for Nature does nothing in vain.

The corolla seems intended to reverberate the rays of the Sun on the parts of fecundation; and we shall be put beyond the reach of doubt as to this, if we consider the colour and the form of it in most flowers. It has been remarked in the preceding Study, that of all colours, white is the most proper for reflecting the heat: now it is in general that which Nature bestows on the flowers that blow at cold seasons and in cold places, as we see is the case in the snow-drop, the lily of the valley, the hyacinth, the narcissus, and the anemone-nemerosa, which come into flower early in the Spring. We must likewise assign to this colour such as have slight shades of the rose and of the azure, as many hyacinths; as well as those which have yellow and shining tints, as the flowers of the dandelion, the butter-flower of the meadow, and the wall gilly-flower. But such as blow at warm seasons and in warm situations, as the cockle, the wild poppy, and the blue-bottle, which grow in summer amongst the corn, are dressed in strong colours, such as purple, deep red, and blue, for these absorb the heat without greatly reflecting it.

I do not know however that there are any flowers entirely black; for in that case it's petals, destitute of all power of reflection, would be entirely useless. In general, of whatever colour a flower may be, the under part of it's corolla, which reflects the rays of the Sun, is of a much paler tint than the rest. This

is so very remarkable that Botanists, who generally consider the colours of flowers as accidents merely, distinguish it by the name of *unguiculus* (a little nail). The unguicle is that with relation to the flower which the belly is with relation to animals: it's shade is always clearer than that of the rest of the petal.

The forms of flowers are no less adapted than their colours to reflect the heat. Their corollæ, divided into petals, are only an assemblage of mirrors directed toward one focus. Of these they have sometimes four, which are plain, as the flower of the cole-wort in the cruciform; or a complete circle, as the daisy in the class of radiated; or spherical portions, as the rose; or entire spheres, as the bells of the lily of the valley; or cones mutilated, as the foxglove, the corolla of which is formed like a sewing thimble.

Nature has placed at the focuses of these, plain, spherical, elliptical, parabolic, and other mirrors, the parts of the fecundation of plants, as she has placed those of generation in animals in the warmest parts of their bodies. These curves, which Geometricians have not yet examined, merit their most profound researches. Is it not astonishing that they should have bestowed such learned pains to find out curves altogether imaginary and frequently useless, and that they should have neglected to study those which Nature employs so regularly, and in such variety, in an infinite number of objects? Be this as it may, Botanists have given themselves still less trouble about the matter. They comprehend those of flowers under a small number of classes, without paying the slightest attention to their use, nay without so much

as

as apprehending that they could have any. They confine themselves entirely to the division of their petals, which frequently change nothing of the configuration of their curves; and they frequently class under the same name those which are the most opposite. Thus, under the general designation of the *monopetalous* (those that have a single petal), they include the spheroid of the lily of the valley and the trumpet of the convolvolus.

On this subject a very remarkable circumstance claims our notice, namely, that frequently such as is the curve formed by the border or upper extremity of the petal, such too is the plan of the whole petal itself; so that nature presents to us the cut or shape of each flower in the contour of it's petals, and gives us at once it's plan and it's elevation. Thus roses, and the whole tribe bearing this denomination, have the border of their petals in sections of a circle, like the curve of the flowers themselves; the pink and blue-bottle, which have their selvage notched, present the plans of their flowers plaited up like fans, and form a multitude of focuses.

For want of the real flower, these curious remarks may be verified from the drawings of Painters who have been the most exact in copying plants, but who are indeed very few in number. Such is, among those few, *Aubriet*, who has drawn the plants of *Tournefort's* Voyage to the Levant,* with the taste of a Painter and the precision of a Botanist. You may there see the confirmation of what I have just been advancing. For example, the *scorzonera Græca saxa-*

* *Tournefort*'s Voyage to the Levant, vol. i.

tilis

tilis & maritima foliis variè laciniatis (the Greek saxatile and marine scorzonera, with leaves variously scolloped) which is there represented, has it's petals or half-flowers squared at the extremity, and plane in their surface. The flower of the *stachis Cretica latifolia* (the broad-leaved stachis of Crete), which is a monopetalous tubular plant, has the upper part of it's corolla undulated, as well as it's tube. The *campanula Græca saxatilis jacobeæ foliis* (the Greek bell-flower of the rocks, with ragwort leaves) presents these consonances in a manner still more striking. This campanula, which *Tournefort* considers as the most beautiful he had ever seen, and which he sowed in the Royal Garden at Paris, where it succeeded very well, is of the pentagonal form. Each of it's faces is formed of two portions of a circle, the focuses of which undoubtedly meet on the same anthera; and the border of this campanula is notched into five parts, each of which is likewise cut into the form of a Gothic arch, as each subdivision of the flower is. Thus, in order to know at once the curve of a flower, it is sufficient to examine the brim of it's petal.

It is of much utility to attend to this observation, for otherwise it would be extremely difficult to determine the focuses of the petals. Besides, flowers lose their internal curves in herbaries. I believe these consonances to be general; I presume not however to assert that they admit of no exceptions. Nature may deviate from this order in some species, for reasons which I know not. It cannot be too frequently repeated—She has no general and unvarying Law, except the accommodation of beings endowed with sensibility.

sibility. The relations just now suggested between the curve of the brim and that of the petal, seem beside to be founded on this universal Law, as they present conformities of such agreeable approximation.

The petals appear to such a degree destined to warm the parts of fecundation, that Nature has placed a circle of them around most compound flowers, which are themselves aggregations of small tubes, infinite in number, that form so many particular flowers, or, if you will, flowrets. This is obviously remarkable in the petals which surround the disks of daisies and sun-flowers. They are likewise to be met with around most of the umbelliferous plants: though each flowret which composes them has it's particular petals, there is a circle of others still greater which encompasses their assemblage, as you may see in the flowers of the daucus.

Nature has still other means of multiplying the reflexes of heat in flowers. Sometimes she places them on stems of no great elevation, in order to collect warmth from the reflections of the Earth; sometimes she glares over their corollæ with a shining varnish, as the yellow meadow-ranunculus, known by the trivial name of butter-flower. Sometimes she withdraws the corolla, and makes the parts of fecundation to shoot from the partition of an ear, of a cone, or of the branch of a tree. The forms of the spike and of the cone appear to be the best adapted for reverberating on them the action of the Sun, and to ensure their fructification, for they always present some one side or another sheltered from the cold. Nay, it is very remarkable that the aggregation of flowers in a conical

conical and spike form is very common to herbs and trees of the North, and rarely to be found in those of the South. Most of the gramineous plants which I have seen in southern Countries do not carry their grains in a spike or closely compacted ear, but in flowing tufts, and divided into a multitude of particular stems, as the millet and rice. The maize or Turkey-corn, I admit, bears it's grains in a large ear; but that ear is for a considerable time shut up in a bag, and in bursting from it, pushes away over it's head a long covering of hair, which seems entirely destined to the purpose of sheltering it's flowers from the heat of the Sun.

Finally, what confirms me in the belief that the flowers of plants are adapted to the action of heat, conformably to the nature of every climate is this, that many of our European plants vegetate extremely well in the Antilles Islands, but never come to seed there. Father *du Tertre* observed, that in those islands* the cabbage, the sainfoin, the lucern, the savory, the sweet basil, the nettle, the plantain, the wormwood, the sage, the liver-wort, the amaranth, and all our species of gramineous plants, throve there wonderfully well, but never produced grains. These observations demonstrate, that it is neither the air nor the soil which is inimical to them, but the Sun, which acts with too much vivacity on their flowers, for most of these plants have theirs aggregated into an ear, which generally encreases the repercussion of the solar rays.

I believe, at the same time, that such plants might

* Natural History of the Antilles, by Father *du Tertre*.

be

be naturalized to the West-India Islands, as well as many others of our temperate climates, by selecting from the varieties of their species those whose flowers have the smallest fields and whose colours are the deepest, or those whose pannicles are divergent.

Not that Nature has no other resources except such as these, to make plants of the same genus attain perfection in different seasons and climates. She can render their flowers capable of reflecting the heat in different degrees of Latitude, without any very sensible alteration of the form. Sometimes she mounts them on elevated stems, to remove them from the influence of the refraction of the ground. It is thus she has placed between the Tropics most of the apparent flowers upon trees. I have seen very few there in the meadows, but a great many in the forests. In those countries you must look aloft in order to have a sight of flowers; in our native climes we must cast our eyes on the ground for this purpose, for with us flowers grow on herbage and shrubbery. Sometimes she expands them under the shade of leaves; such are those of the palm-tree, of the banana, and of the *jacquier*, which grow close to the trunk of the tree. Such likewise are, in our temperate climates those large white bell-formed flowers, known by the name of Lady's-smock, which delight in the shade of the willow.

There are others, such as most part of the convolvoluses, which expand only in the night; others grow close to the ground and exposed, as the pansy, but their drapery is dusky and velveted. There are some which receive the action of the Sun when at a considerable

siderable height, as the tulip; but Nature has taken her precautions so exactly, as to bring out this stately flower only in the Spring, to paint it's petals with strong colours, and to daub the bottom of it's cup with black.* Others are disposed in girandoles, and

* This flower from it's colour is in Persia the emblem of perfect lovers. *Chardin* tells us, that when a young Persian presents a tulip to his mistress, it is his intention to convey to her this idea, that like this flower he has a countenance all on fire, and a heart reduced to a coal. There is no one Work of Nature but what awakens in man some moral affection. The habits of society insensibly efface at length the sentiment of it; but we always find it in vigor among Nations who still live near to Nature.

Many alphabets have been imagined in China in the earlier ages after the wings of birds, fishes, shells, and flowers: of these very curious characters may be seen in the China Illustrated of Father *Kercher*. It is from the influence of those natural manners, that the Orientals employ so many similitudes and comparisons in their languages. Though our metaphysical eloquence makes no great use of them, they frequently produce nevertheless a very striking effect. *J. J. Rousseau* has taken notice of that which the Ambassador of the Scythians addressed to *Darius*. Without speaking a word, he presented him with a bird, a frog, a mouse, and five arrows.† *Herodotus* relates, that the same *Darius* sent word to the Greeks of Ionia who were laying waste the country, that if they did not give over their depredations he would treat them like pines. The Greeks, who by this time had become infected with wit, and had proportionably begun to lose sight of Nature, did not comprehend the meaning of this. Upon enquiry, they at length discovered that *Darius* meant they should understand it to be his resolution utterly to exterminate them; for the pine-tree once cut down shoots out again no more.

† *Darius* at first understood this as a complete surrender of Scythian independence into his hands; but the event instructed him, that this high-spirited people intended to convey a bold defiance: "Unless you can fly as a bird, "dig as a mouse, swim as a frog, our arrows shall reach you." H. H.

receive

receive the effect of the solar rays only under one point of the compass. Such is the girandole of the lilach, which, pointing with various aspects to the East, to the South, to the West, and to the North, presents on the same cluster flowers in bud, halfopen, fully blown, fading, and all the delightful shades of the florification.

There are flowers, such as the compound, which being in a horizontal position and completely exposed, behold the Sun, like the Horizon itself, from his rising to his setting; of this description is the flower of the dandelion. But it possesses very peculiar means of sheltering itself from the heat: it closes entirely whenever the heat becomes excessive. It has been observed to open in Summer at half an hour after five in the morning, and to collect it's petals toward the centre about nine o'clock. The flower of the garden lettuce, which is on the contrary in a vertical plane, opens at seven o'clock and shuts at ten.

From a series of similar observations it was, that the celebrated *Linnæus*, formed a botanical time-piece; for he had found plants which opened their flowers at every hour of the day and of the night. There is cultivated in the King's Garden at Paris a species of serpentine aloes, without prickles, whose large and beautiful flower exhales a strong odour of the vanilla during the time of it's expansion, which is very short. It does not blow till toward the month of July, and about five o'clock in the evening: You then perceive it gradually open it's petals, expand them, fade

and

and die. By ten o'clock of the same night it is totally withered, to the great astonishment of the spectators, who flock in crowds to the sight; for what is uncommon is alone admired. The flower of our common thorn, I do not mean that of the white-thorn, is still more extraordinary; for it flowers so rapidly that there is scarce time to observe it's expansion.

These observations, taken in their connection, clearly demonstrate the relations of the corollæ to the heat of the Sun. To those which have been already produced, I shall subjoin one more by way of conclusion, which evidently proves the use for which they are intended; it is this, The duration of their existence is regulated by the quantity of heat which it is their destination to collect. The hotter it is the shorter is their duration. They almost all drop off as soon as the plant is fecundated.

But if Nature withdraws the greatest number of flowers from the too violent action of the Sun, she destines others to appear in all the lustre of his rays, without sustaining the least injury from them. On the first she bestows dusky reflectors, or such as can close themselves as occasion requires; she provides others with parasols. Such is the crown-imperial, whose flowers, like a bell inverted, grow under the shade of a tuft of leaves. The chrysanthemum-peruvianum, or to employ a better-known term, the turnsol, which turns continually toward the Sun, covers itself, like Peru the country from which it comes, with dewy clouds, which cool and refresh it's flowers during the most

most violent heat of the day. The white flower of the lychnis, which blows in our fields in Summer, and presents at a distance the resemblance of a Maltese-cross, has a species of contraction or narrow collar placed at it's centre, so that it's large shining petals turned back outwardly do not act upon it's stamina. The white narcissus has in like manner a small tunnel. But Nature stands in no need to create new parts, in order to communicate new characters to her Works. She deduces them at once from existence and from non-existence; and renders them positive or negative at her pleasure. She has given curves to most flowers, for the purpose of collecting the heat at their centre: she employs the same curves when she thinks proper, in order to dissipate the heat: she places the focuses of them so as to act outwardly. It is thus that the petals of the lily are disposed, which are so many sections of the parabola. Notwithstanding the large size and the whiteness of it's cup, the more it expands the more it disperses the fervent heat of the Sun; and while in the middle of Summer, at noon-day, all other flowers, parched by his burning rays, droop and bend their heads to the ground, the lily rears his head like a king, and contemplates face to face the dazzling orb, which is travelling majestically through the Heavens.

I proceed to display in a few words, the positive or negative relations of flowers with respect to the Sun, to the five elementary forms which I have laid down in the preceding Study as the principles of the harmony of bodies. This is not so much a plan which I take upon me to prescribe to Botanists, as an invi-

tation to engage in a career, so rich in observations, and to correct my errors, by communicating some portion of their knowledge.

There are, therefore, reverberating powers *perpendicular, conical, spherical, elliptical, parabolical, or plane.* To these maybe referred most of the curves of flowers. There are likewise some flowers in form of a parasol, but the others are much more numerous; for the negative effects in every harmony are in much greater number than the positive. For example, there is but one single way of coming into life, and there are thousands of going out of it. We shall oppose however to every positive relation of flowers to the Sun, a principal negative relation, that we may be enabled to compare their effects in every Latitude.

PERPENDICULAR reverberating flowers are those which grow adhering by the back to a cone, to long catkins, or to an ear: such are those of the cedar, of the larch, of the fir, of the birch, of the juniper; of most of the northern gramineous plants, of the vegetables of cold and lofty mountains, as the cypress and the pine; or of those which flower in our climates about the end of Winter, as the hazel and the willow. A part of the flowers in this position is sheltered from the North wind, and receives the reflection of the Sun from the South side.

It is remarkable that all vegetables which bear cones, catkins, or spikes, present them at the extremity of their stems, exposed to all the action of the Sun. It is not so with those which grow within the Tropics; most of which, such as the palm-tree, bear divergent flowers attached to pendent clusters, and shaded

shaded by their branches. The greatest part of the gramineous plants of warm countries have likewise divergent ears; such are the millets of Africa. The solid ear of the American maize is crowned with a hairy tuft which shelters its flowers from the Sun. On the annexed plate are represented an ear of European corn, and an ear of the rice of southern Asia, to furnish the means of comparison.

Conical reverberating flowers reflect on the parts of florification a complete cone of light. It's action is very powerful; and it is accordingly very remarkable, that Nature has given this configuration of petal only to flowers which grow under the shade of trees, as to the convolvulus, which scrambles up around their trunk; and that she has assigned to this flower a very transient duration, for it scarcely lasts half a day; and when it's fecundation is completed, the border contracts inwardly, and gathers together like a purse. Nature has however given it a place in southern latitudes, but she has there tinged it with violet and blue, in order to weaken the effect. Besides, this flower scarcely ever opens in hot countries except in the night. From this nocturnal character I presume it is, that we are chiefly enabled to distinguish the convolvulus of the South from that of our own climates, which blows in the day-time. In the plate we have represented the day-convolvulus, or that which is native with us, expanded; and that of the night or of hot countries, closed; the one having a positive character with the light and the other a negative.

The flowers which partake the most of this conical

form are those which grow early in the Spring, as the flower of the arum, which is formed like a cornet; or those which thrive on lofty mountains, as the bear's-ear of the Alps. When Nature employs it in Summer it is almost always with negative characters, as in the flowers of the fox-glove, which are inclined, and dyed a deep red or blue colour.

Spherical reverberating flowers are those whose petals are formed into segments of a circle. One might amuse himself very agreeably in observing that these spherically formed petals have at their focuses the antheræ of the flower supported on fibrets, longer or shorter as the effect intended may require. It deserves farther to be remarked, that each petal is adapted to it's particular anthera, sometimes to two, or even to three: so that the number of petals in a flower divides almost always exactly that of the antheræ. As to the petals, they scarcely ever exceed the number of five in rose-formed flowers, as if Nature had designed to express in that the number of the five terms of elementary progression, of which this beautiful form is the harmonic expression.

Spherical reverberating flowers are very common in our temperate climates. They do not throw back the whole reflection of their disks on the antheræ like the convolvulus, but only the fifth part, because each of their petals has it's particular focus. The rose-formed flower is spread over most fruit-trees, as the apple, the pear, the peach, the plumb, the apricot, and the like; and over a great part of our shrubbery and herbage, such as the black and white-thorn, the bramble, the anemone, and many others, most of which

which produce for Man a nutritious fruit, and which flower in the month of May. To this form may be likewise referred such as are spheroidal; the lily of the valley for example.

This form, which is the harmonic expression of the five elementary forms, was admirably adapted to a temperature like ours, which is itself the proportional medium between that of the Icy and of the Torrid Zone. As spherical reflectors collect a great quantity of rays at their focuses, their action is very powerful, but at the same time of very transient duration. It is well known that nothing fades more quickly than a rose.

Rose-formed flowers are very rare between the Tropics, especially those whose petals are white. They thrive only under the shade of trees. I have known many of the inhabitants of the Isle of France make fruitless efforts to raise strawberries there; but one of them who lived indeed in an elevated part of the Island, found means of procuring them in great plenty, by planting his beds under trees, and in ground but half cleared.

As a compensation for this, Nature has multiplied in warm countries papilionaceous, or leguminous flowers. The leguminous flower is entirely opposite to the rose-formed. It usually has five rounded petals like the other: but instead of being disposed round the centre of the flower in order to reverberate thither the rays of the Sun, they are on the contrary folded inward around the antheræ for the purpose of sheltering them. You distinguish in them a pavilion, two wings, and a ridge, usually divided into two, by

which the antheræ and the embryon of the fruit are closely covered over. Between the Tropics accordingly, a great number of trees, shrubs, creepers, and grasses, have papilionaceous flowers. Every species of our pease and french-beans succeed there wonderfully well, and those countries produce infinite varieties of them. Nay it is remarkable, that even at home those plants delight in a sandy and warm soil, and exhibit their flowers in the middle of Summer. I consider leguminous flowers therefore as of the parasol kind. To those same negative effects of the Sun may likewise be referred the form of flowers with gullets, which conceal their antheræ, such as the calfs-snout, which takes pleasure in blowing on the sides of walls.

Elliptical reverberating flowers are those which present oval-formed cups, narrower a-top than in the middle. It is very perceptible that this form of cup, the perpendicular petals of which approach toward each other at the summit, shelters in part the bottom of the flower: and that the curves of these same petals, which have several focuses do not collect the rays of the Sun toward one single centre: such is the tulip. It is remarkable that this oblong-formed flower is more common in warm countries than the rose-formed. The tulip grows spontaneously in the vicinity of Constantinople. To this form may likewise be referred that of the lilaceous, which are more common there than elsewhere. However, when Nature employs them in countries still farther to the South, or in the middle of Summer, it is almost always with negative characters; thus she has inverted

inverted the tulip-form flowers of the imperial, which is originally from Persia, and has shaded them with a tuft of foliage. Thus she bends back outwardly in our climates the petals of the lily; but the species of white lilies which grow between the Tropics have besides their petals cut out into thongs.

Flowers with PARABOLIC or PLANE mirrors, are those which reflect the rays of the Sun in parallel directions. The configuration of the first gives much lustre to the corolla of these flowers, which emit from their bosom, if I may be allowed the expression, a bundle of light, for they collect it toward the bottom of their corolla, and not on the antheræ. It is perhaps in order to weaken the action of it, that Nature has terminated flowers of this form in a species of cowl, which Botanists call spur. It is probably in this tube that the focus of their parabola terminates, which is perhaps situated there, as in many curves of this kind beyond its summit. Flowers of this sort are frequent between the Tropics; such is the flower of the *poincillade*, of the Antilles, otherwise called the peacock-flower, on account of it's beauty; such is also the nasturtium or nun of Peru. It is even pretended that the perennial species is phosphoric in the night-time.

Flowers with plane mirrors produce the same effects; and Nature has multiplied the models of them in our Summer flowers, and in those which thrive in warm and sandy soils, as the radiated; such are the flowers of the dandelion. We likewise meet with them in the flowers of the doronicum, of the lettuce, of the succory; in the asters, in the meadow

daisy, and others. But she has placed the original model of them under the Line, in America, in the broad sun-flower, which we have borrowed from Brasil.

These being flowers whose petals have the least activity, are likewise those which are of the longest duration. Their attitudes are varied without end. Such as are horizontal, like those of the dandelion, close, it is said, toward the middle of the day; they are likewise such as are the most exposed to the action of the Sun, for they receive his rays from his rising to his setting.

There are others which instead of closing their petals invert them, and this produces nearly the same effect; such is the flower of the camomile. Others are perpendicular to the Horizon, as the flower of lettuce. The blue colour with which it is tinged, contributes farther towards weakening the rays of the Sun, which in this respect would act too vehemently upon it. Others have only four horizontal petals, such as the cruci-form; the species of which are very common in hot countries. Others bear around their disk flowrets which overshadow it; such as the blue-bottle of the corn-field, which is represented on the plate in opposition to the daisy, This last flowers early in the Spring, and the other in the middle of Summer.

We have said somewhat of the general forms of flowers, but we should never come to a conclusion were we to enter into a discussion of their various aggregations. I believe however that they may be referred to the plan itself of the flowers. Thus the umbelliferous

umbelliferous flowers present themselves to the Sun under the same aspects as the radiated.

I must beg leave to recapitulate only what has been said respecting their reflecting mirrors. The reverberated perpendicular of a cone or ear form, collects on the antheræ of the flowers an arch of light of ninety degrees from the Zenith to the Horizon. It farther presents in the inequality of it's panels reflecting surfaces.

The conical reflector collects a cone of light of sixty degrees. The spherical reflector unites in each of it's five petals an arch of light of thirty-six degrees of the Sun's course, supposing that luminary to be in the Equator.

The elliptical reflector collects a smaller quantity from the perpendicular position of it's petals; and the parabolic reflector, as well as that with plane mirrors, sends back the rays of the Sun divergently or in parallels.

The first form appears to be very common in the flowers of the Icy Zones; the second in those which thrive under the shade; the third in temperate latitudes; the fourth in warm countries; and the fifth in the Torrid Zone. It would likewise appear that Nature multiplies the divisions of their petals in order to diminish their action. Cones and ears have no petals. The convolvulus has but one; rose formed flowers have five; elliptical flowers, as the tulip and the lilaceous, have six; flowers with plane reflectors, as the radiated, have a great number.

Farther, flowers have parts adapted to the other elements. Some are clothed externally with a hairy garment

garment to shelter them from the cold. Others are formed to blow on the surface of the water; such are the yellow roses of the nymphæa, which float on lakes, and accommodate themselves to the various movements of the waves without being wet by them, by means of the long and pliant stems to which they are attached. Those of the *valisneria* are still more artfully disposed. They grow in the Rhone, and would be there exposed to frequent inundation by the sudden swellings of that river, had not Nature given them stems formed like a cork-screw, which draw out at once to the length of three or four feet.

There are other flowers adapted to the winds and to the rains, as those of pease, which are furnished with little boats to cover and shelter the stamina and the embryons of their fruits* Besides, they have large pavilions, and rest on tails bent and elastic as a nerve; so that when the wind blows over a field of pease, you may see all the flowers turn their backs to the wind like so many weather-cocks.

This class appears to be very generally diffused

* I am persuaded that the bearing of most flowers is adapted to the rains, and for this reason it is that many of them have the form of mufflers or ridges, like little boats inverted, which shelter the parts of fecundation. I have remarked that many species of flowers possess the instinct, shall I venture to call it? of closing themselves when the air is humid, and that the impregnation of fruit tree blossoms is injured much more by the rain than by the frost. This observation is of essential importance to gardeners, who frequently cause the flowers of their strawberry plants to miscarry by watering them. As far as I can judge, it would be better to water plants in blossom by little trenches, according to the Indian method, rather than by aspersion.

over

over places much exposed to the winds. *Dampier* relates that he found the desert shores of New-Guinea covered with pease, whose blossoms were red and blue. In our climates the fern, which crowns the summits of hills always battered with the wind and the rain, bears it's flower turned toward the Earth on the back of it's leaves. There are even certain species of plants the flowering of which is regulated by the irregularity of the winds. Such are those the male and female individuals of which grow on separate stems. Tossed hither and thither over the earth frequently at great distances from each other, the powder of the male could fecundate but a very few female flowers, unless at the season of their florification the wind blew from various quarters. Wonderful to be told! There are invariable generations depending on the variableness of the wind. Hence I presume that in countries where the winds always blow from the same quarter, as between the Tropics, this species of florification must be uncommon; and if it be found there at all, it must be regulated precisely according to the season when those regular winds vary.

It is impossible to entertain a doubt respecting those admirable relations, however remote they may appear, when we observe the attention with which Nature has preserved flowers from the shocks to which they might be exposed, from the winds themselves, upon their stems. She inwraps them for the most part in an integument, which Botanists call the *calix*. The more ramous the plant is, the thicker is the calix of it's flower. She sometimes fringes it with

with little cushions and beards, as may be seen in the rose-bud. Thus the mother puts a pad round the head of her little child, to secure it against accidents from falling. Nature has so clearly marked her intention as to this, in the case of the flowers of ramous plants, that she has deprived of this clothing such as grow on stems that are not branchy, and where they are in no danger from the agitation of the winds. This may be remarked with regard to the flowers of Solomon's seal, of the lily of the valley, of the hyacinth, of the narcissus, of most of the lilaceous, and of plants which bear their flowers isolated on perpendicular stems.

Flowers have farther very curious relations with animals and with Man, from the diversity of their configurations and from their smells. Those of one species of the orchis represent bugs, and exhale the same unpleasant odour. Those of a species of the arum resemble putrid flesh, and have the infection of it to such a degree, that the flesh-fly resorts thither to deposit her eggs. But those relations hitherto very superficially investigated, do not come in so properly under this article; it is sufficient for me to have here demonstrated, that they actually have very clearly marked relations with the elements, and especially with the Sun.

When Botanists shall have diffused over this branch of the subject all the light of which it is susceptible, by examining their focuses, the elevation to which they rise above the ground, the shelter or the reflection of the bodies which are in their vicinity, the variety of their colours, in a word, all the means by which

which Nature compensates the differences of their several exposures, and they will no longer doubt about those elementary harmonies; they will acknowledge that the flower, far from presenting an unvarying character in plants, exhibits on the contrary a perpetual character of diversity. It is by this principally that Nature varies the species in the same genus of plant, in order to render it susceptible of fecundation on different sites. This explains the reason why the flowers of the great chestnut of India, but originally from America, are not the same with those of the European chestnut; and that those of the fullers-thistle, which thrives on the brink of rivers, are different from those of thistles which grow in lofty and dry places.

A very extraordinary observation shall serve irrefragably to confirm all that we have just now advanced: it is this, That a plant sometimes totally changes the form of it's flowers in the generation which reproduces it. This phenomenon greatly astonished the celebrated *Linnæus* the first time that it was submitted to his consideration. One of his pupils brought him one day a plant perfectly similar to the linarium, the flower excepted; the colour, the savour, the leaves, the stem, the root, the calix, the pericarpium, the seed, in a word, the smell, which is a remarkable circumstance, were exactly the same, only it's flowers were in form of a tunnel, whereas those of the linarium are gullet-formed. *Linnæus* imagined at first that his pupil intended to put his knowledge to the test, by adapting a strange flower to the stem of that plant; but he satisfied himself that it

it was a real linarium, the flower of which Nature had totally changed. It had been found among other linaria, in an island seven miles distant from Upsal, near the shore of the sea on a sandy and gravelly bottom. He himself put it to the proof, that it re-perpetuated itself in this new state by it's seeds. He afterwards found some of it in other places; and what is still more extraordinary, there were among these last some which carried on the same stalk flowers tunnel-formed, and flowers gullet-formed.

He gave to this new vegetable the name of *pelorum* from the Greek word πέλωρ, which signifies prodigy. He afterwards observed the same variations in other species of plants, and among the rest in the eriocephalous thistle, the seeds of which produce every year in the garden of Upsal the fantastic thistle of the Pyrennées.* This illustrious Botanist accounts for these transformations, as being the effect of a mongrel generation, disturbed by the fecundating farina of some other flower in the vicinity. It may be so; to his opinion however may be opposed the flowers of the pelorum and of the linarium, which he found united on the same individual. Had it been the fecundation which transformed this plant, it ought to have given similar flowers in the whole individual. Besides, he himself has observed that there was not the slightest confusion in the other parts of the pelorum, any more than in it's virtues; but this must have been the case, as well as in the flower, had it been produced by a mixture of some strange breed. Finally, the pelorum re-produced

* Upsalian Dissertation, for Dec. 1744; page 59, note 6.

itself

itself by seed, which does not take place in any one mongrel species of animals.

This sterility in mongrel branches is an effect of the sage consistency of Nature, who cuts off divergent generations, in order to prevent the primordial species from being confounded, and from at length disappearing altogether. As to the rest, I pry neither into the causes nor the means which she is pleased to conceal from me, because they far transcend my comprehension. I confine my enquiries to the ends which she kindly unfolds; I confirm myself in the belief, from the variety of flowers in the same species and sometimes in the same individual, that they serve in certain cases as reflectors to vegetables, for the purpose of collecting, conformably to their position, the rays of the Sun on the parts of fecundation; and in other cases as parasols, to put them under covert from excessive heat.

Nature deals by them nearly as she does by animals which are exposed to the same variations of Latitude. In Africa she strips the sheep of the woolly fleece, and gives her sleek smooth hair, like that of the horse: and to the North on the contrary she clothes the horse with the shaggy fur of the sheep. I have been an eye-witness of this double metamorphosis at the Cape of Good-Hope and in Russia. I have seen at Petersburg Norman and Neapolitan horses, whose hair naturally short was so long and so frizzled in the middle of Winter, that you would have believed them covered with wool like sheep. It is not without reason, therefore, that the ancient proverb says, GOD *tempers the wind to the shorn lamb:*

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and when I behold his paternal hand varying the fur of animals conformably to the degree of heat and cold, I can easily believe that it varies in like manner the mirrors of flowers conformably to the Sun. Flowers then may be divided with relation to the Sun into two classes; into reverberating flowers, and flowers in form of a parasol.

If there be any constant character in plants we must look for it in the fruit. It is thitherward that Nature has directed all the parts of vegetation, as to the principal object. That saying of WISDOM itself, *by their fruits ye shall know them*, is at least as applicable to plants as to the human species.

We shall examine therefore the general characters of plants, with relation to the places where their seeds are accustomed to grow. As the animal kingdom is divided into three great classes, quadrupeds, volatiles, and aquatics, relatively to the three elements of the Globe; we shall in like manner divide the vegetable kingdom into aërial or mountain-plants; into aquatics, or those of the shores; and into terrestrial, or those of the plains. But as this last participates of the two others, we shall not dwell upon it; for though I am persuaded that every species, nay that every variety may be referred to some particular site of the earth, and may grow there in it's highest degree of beauty, it is sufficient to say as much of it here as may be necessary to the prosperity of a small garden. When we shall have traced invariable characters in the two extremities of the vegetable kingdom, it will be easy to refer to the intermediate classes those

those which are adapted to them. We begin with the plants of the mountains.

ELEMENTARY HARMONIES OF PLANTS WITH THE WATER AND THE AIR, BY MEANS OF THEIR LEAVES AND FRUITS.

When the AUTHOR of Nature designed to clothe with vegetables even the highest and steepest pinnacles of the Earth, He first adapted the chains of mountains to the basons of the seas which were to supply them with vapours; to the course of the winds which were to waft them thither, and to the different aspects of the sun by which they were to be heated. As soon as those harmonies were established between the elements, the clouds ascended out of the Ocean, and dispersed themselves over the most remote parts of the Continents. There they distilled under a thousand different forms, in fogs, in mists, in dews, in rains, in snows. They descended from the heights of the Atmosphere in every possible variety of manner; some in a tranquil air, such as our Spring showers, came down in perpendicular drops as if they had been strained through a sieve; others driven by the furious winds, beat horizontally on the sides of the mountains; others fell in torrents, like those which for nine months of the year inundate the Island of Gorgona, placed in the heart of the Torrid Zone, in the burning Gulf of Panama. There were some which accumulated themselves in mountains of snow, on the accessible summits of the Andes, to cool by their effusions the Continent of South-America, and by their icy Atmosphere, the vast expanse of the Pacific

cific Ocean. In a word, mighty rivers flowed over regions where the rain never descends, and the Nile watered the plains of Egypt.

Then GOD said: "Let the Earth bring forth "grass, the herb yielding seed, and the fruit-tree "yielding fruit after his kind, whose seed is in itself "upon the Earth." At the voice of the All-Mighty, the vegetables appeared with organs perfectly fitted to collect the blessings of Heaven. The elm arose on the mountains which skirt the Tanaïs, clothed with leaves in form of a tongue: the tufted box started from the brow of the Alps; and the prickly caper-tree from the rocks of Africa, with leaves hollowed into spoons. The pines of the sandy Norwegian hills attracted the vapours which were floating in the air, with their slim foliage disposed like a Painter's pencil; the verbascum displayed it's broad leaves on the parched sand, and the fern presented on the hill it's fan-like foliage to the rainy and horizontal winds. A multitude of other plants, from the bosom of the rocks, from strata of flint, nay even from marble incrustations, drunk in the waters of Heaven by cornets, by sandals, and by cruets. From the cedar of Lebanon down to the violet which perfumes the grove, there was not one but what presented it's large Goblet, or it's tiny Cup, conformably to it's necessity, or it's station.

This adaptation of the leaves of plants in elevated situations, for receiving the descending distillations of the rain is varied without end; but the character of it is discernible in most, not only in their concave forms, but likewise in a little canal, scooped out on

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the pedicle by which they are attached to their branches. It has something of a resemblance to that which Nature has traced on the upper lip of a Man, to receive the humours which descend from the brain. It is particularly perceptible on the leaves of artichokes, which being of the nature of thistles, agree with dry and sandy situations. These have besides, collateral awnings to prevent the loss of any of the water that falls from Heaven. Plants which grow in places very hot and very parched, sometimes have their stems or their leaves transformed entirely into a canal. Such are the aloes of the island of Zocotara, in the mouth of the Red-Sea, or the prickly taper of the Torrid Zone. The aqueduct of the aloes is horizontal, and that of the taper perpendicular.

What has prevented Botanists from remarking the relations which the leaves of plants have with the waters that feed and refresh them, is their seeing them every where nearly of the same form, in the valleys, as on the heights; but though mountain-plants present foliages of every kind of configuration, you may easily discern from their aggregation in form of pencils or fans, from the gathering of the leaves, or from equivalent signs, that they are destined to receive the rain water, but chiefly from the aqueduct which I have just mentioned. This aqueduct is traced on the pedicle of the smallest leaves of mountain-plants; by means of it Nature has rendered the forms themselves of aquatic-plants susceptible of vegetation in the most parched situations.

The bulrush, for example, which is only a round and full straw that grows by the water-side, did not

appear susceptible of collecting any humidity in the air, though it is very well suited to lofty situations, from it's capillaceous form, which like that of gramineous plants presents nothing to the wind to lay hold of. In fact, if you consider the different species of rush which clothe the mountains in many parts of the world, such as that called *ichu*, on the lofty mountains of Peru, the only vegetable almost that grows there, and those which thrive with ourselves in dry sands or on heights, you would at the first glance believe them similar to the rush of marshy places; but with a little attention, and not without astonishment, you will observe that they are hollowed into a furrow the whole of their length-wise direction. They are like other rushes convex on one side, but they differ from them essentially, in that they are all concave on the other; I was enabled to distinguish by this same character the spartha, which is a rush of the mountains of Spain, and is now frequently manufactured at Paris into cordage for their draw-wells.

Many leaves even of the plants of the plains assume on their first springing up this form of little furrow, or spoon, as those of the violet, and of most gramineous plants. You may perceive in the Spring, the young tufts of these raising themselves upright toward Heaven, like paws, to catch the falling drops, especially when it begins to rain; but most plants of the plains lose their gutter as they expand. It has been bestowed on them only during the season when it was necessary to their growth. It is permanent only in the plants of the mountains. It is traced as has been mentioned on the pedicle of the leaves, and

conducts

conducts the rain water into the tree from the leaf to the branch: the branch, by the obliquity of it's position, conveys it to the trunk, from whence it descends to the root, by a series of successive dispositions. If you pour water gently over the leaves of a mountain-shrub which are the farthest from it's stem, you will perceive it pursue the progress which I have just indicated, and not a single drop will be lost on the ground.

I have had the curiosity to measure in some mountain-plants, the inclination which their branches form with their stem; and I have found in at least a dozen different species, as in the fern, the thuia, and the like, an angle of about thirty degrees. It is very remarkable that this degree of incidence is the same with that which is formed in a flat country, by the course of many rivulets and smaller rivers, with the great rivers into which they discharge themselves, as may be ascertained by reference to maps. This degree of incidence appears to be the most favourable to the efflux of many fluids, which direct themselves toward one single line. The same Wisdom has regulated the level of the branches in trees, and the course of the stream through the plains.

This inclination undergoes some varieties in certain mountain trees. The cedar of Lebanon, for example, sends forth the lower part of it's branches in an upward direction toward Heaven, and lowers their extremities, by bending them downward to the Earth. They have the attitude of command which is suited to the king of vegetables, that of an arm raised up into the air, with the hand gently inclining. By

means of the first disposition, the rain water is conveyed along the sloping branch to the trunk; and by the second, the snows in the regions of which it takes delight to dwell, slide away from off it's foliage. It's cones have in like manner two different attitudes; for it inclines them at first toward the Earth, to shelter them at the season of their flowering; but when they are fecundated, it erects them toward Heaven. The truth of these observations may be confirmed by referring to a young and beautiful cedar in the Royal Garden, which, though a stranger, has preserved in the midst of our climate the air of a King, and the majestic port of Lebanon.

The bark of most mountain-trees is equally adapted for conducting the rain-water from the branches to the roots. That of the pine is in large perpendicular ribs; that of the elm is cleft and chinked longitudinally; that of the cypress is spongy like the coat of flax.

The plants of mountains and of dry grounds have a farther character, which is in general peculiar to them: it is that of attracting the water which floats in the air in imperceptible vapours. The parietaria (pellitory) which has derived it's name from the Latin word *pariete* (wall), because it grows on the sides of walls, has it's leaves almost always in a humid state. This attraction is common to most trees of the mountains. Travellers unanimously assure us that there is in the mountains of the Island of Ferrol, a tree which furnishes every day to that island a prodigious quantity of water. The islanders call it *garoé*, and the Spaniards *santo*, from it's singular utility. They

tell

tell us it is always surrounded with a cloud which distils copiously along it's leaves, and fills with water the large reservoirs which are constructed at the root of this tree, affording an abundant supply for the island.

This effect is perhaps somewhat exaggerated, though related in nearly the same terms by persons of different Nations: but I give full credit to the general fact. The real case I take to be this: it is the mountain which attracts from afar the vapours of the Atmosphere, and that the tree, situated in the focus of attraction, collects them around it.

Having frequently spoken in the course of this Work of the attraction of the summits of many mountains, the Reader perhaps will not be displeased if I present to him in this place, an idea of that branch of the hydraulic architecture of Nature. Among a great number of curious examples which I might produce to this purpose, and which I have collected, as an addition to my materials on the subject of Geography, I beg leave to present one, which I have extracted not from a systematic Philosopher, but from a simple and unaffectedly sprightly traveller of the last age, who relates things as he saw them, and without pretending to deduce consequences of any kind whatever. It is a description of the summits of the Island of Bourbon, situated in the Indian Ocean, extending to the twenty-first degree of South Latitude. I copy it from the writings of M. *de Villers*, who was then Governor of that island under the East-India Company. It was published in the Journals of the first voyages made by our French Navigators into

Arabia-Felix, about the year 1709, and given to the World by M. *de la Roque*. See that Work, page 201.

"Of those plains," says M. *de Villers*, which are upon the mountains (of Bourbon), "the most remarkable, though no account has hitherto been "given of it, is that to which they have given "the name of the Plain of the Cafres, from a tribe "of that People, slaves to the inhabitants of the "Island, who went thither to conceal themselves, "after they had run away from their masters. From "the shore of the sea you rise by a gentle ascent for "seven leagues together, in order to reach this plain, "by the single path that leads to it, along the river "of Saint Stephen; it is possible however to ride "up on horseback. The soil is good and smooth to "about a league and a half on this side the plain, "planted with large and beautiful trees, the foliage "of which, as it falls, serves for food to the tortoises, "which are to be found there in great numbers.

"The height of this plain may be estimated at "two leagues above the Horizon; it accordingly "appears from below to be quite lost in the clouds. "It's circumference may be about four or five "leagues. The cold is there insupportable, and *a "continual fog, which wets as much as rain*, prevents "your seeing objects ten paces distant; as it falls "in the night, you may see through it more clearly "than by day: but then it freezes dreadfully, and "in the morning before sun rise the plain is frozen "all over.

"But what strikes the eye of the beholder as "very

"very extraordinary, there are certain elevations of "ground cut out almost in form of round columns, "and of a prodigious height; for they cannot be "much lower than the turrets of Notre-Dame at "Paris. They are put down like pins on the skittle-"ground, and the resemblance is so strong, that you "may easily mistake on reckoning them: they go "by the name of *pitons* (pins). If you wish to stop "by one of those eminences to take rest, such of "your company as are not inclined to repose, but "want to go forward, must not withdraw so far as "two hundred paces, otherwise they will be in great "danger of not finding again the point of separa-"tion, these pins are so many in number, all similar "in form, and so much arranged in the same man-"ner, that the Creoles who are natives there are "themselves liable to mistake.

"For this reason it is, that in order to prevent the "unpleasant consequences of such an error, when a "company of travellers take station at one of the "pins, if they are disposed to make a further excur-"sion, they leave a person at the place of rendezvous "to make a fire or raise a smoke which may serve "to direct and bring back the strayers; and if the "*fog* be so *thick*, which is frequently the case, as to "hinder the fire or the smoke from being seen, they "provide themselves with a kind of large shells, "one of which is left with him who keeps station at "the pin; another is carried off by the separating "party: and when they wish to return, some one "blows violently into the shell as into a trumpet, "which emits a very shrill sound, and is capable of

"being

" being heard at a great distance; this is answered " by the other, and being repeated as often as is ne- " cessary, they are easily recovered from straying, " and collected at the point of departure. With- " out such precautions the traveller might be be- " wildered.

" In this plain are many aspin trees, and they are " always green. Other trees are covered with a " moss of more than a fathom in length around " their trunk and large branches. They are withered, " without foliage, and so impregnated with mois- " ture, that it is impossible to make them take fire. " If with much difficulty you are able to kindle some " of the smaller boughs, it is only a dark fire with- " out flame, which emits a reddish smoke that de- " files the meat without roasting it. You can hardly " find a spot in this plain on which to kindle a fire, " unless by looking about for some small elevation " round the peaks; for the soil of the plain is so hu- " mid that the water every where spouts out, so " that you are continually in mud, and moistened up " to the calf of the leg. Great numbers of blue " birds are to be seen there nestling in the herbage, " and among the aquatic ferns. This plain was un- " known before the desertion of the Cafres. In order " to get down you must return by the same way " that you descended, unless you choose to run the " risk of another path, which is very rough and dan- " gerously steep.

" From the Plain of the Cafres may be seen the " mountain known by the name of *Trois Salases*, " from the three points of that rock, the loftiest in

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" the Island of Bourbon. All it's rivers issue from " thence, and it is so steep on every side that there " is no possibility of climbing it.

" There is besides in this island another plain, " called the plain of Silaos, higher than that of the " Cafres, and of no greater value; it is extremely " difficult to get up to it."

In the lively description of our Traveller we must overlook some errors in Physics, such as his assigning to the Plain of the Cafres an elevation of two leagues above the Horizon. He had not learned from the barometer and thermometer that there is no such elevation on the face of the Globe, and that at the perpendicular height of one league only, the freezing point is invariable. But from the thick fog which surrounds those peaks, from that continual mist which wets as much as rain, and which falls during the night, it is evidently perceptible that they attract to them the vapours which the Sun raises out of the Sea in the day-time, and which disappear in the night. Hence is formed that sheet of water which inundates the Plain of the Cafres, and from which most of the brooks and rivulets that water the island take their rise. You may equally distinguish a vegetable attraction in those evergreen aspins, and those other trees at all times humid, which it is impossible to kindle into flame.

The island of Bourbon is almost round, and rises out of the Sea in the shape of half an Orange. On the highest part of this hemisphere are situated the Plains of Silaos and of the Cafres, where Nature has placed those labyrinths of peaks continually involved

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in fogs, planted like nine pins, and elevated like so many turrets.

Did time and room permit, I could make it evident that there are a multitude of similar peaks on the chains of lofty mountains, of the Cordeliers, of Taurus and others, at the centre of most islands, without admitting the possibility of supposing, though the opinion be current, that they are the remains of a primitive Earth raised to that height; for what must have become, as has been already demanded, of the wreck of that earth, the pretended testimonies of which arise on every hand over the surface of the Globe? I could demonstrate that they are placed in aggregations, and in situations adapted to the necessities of the countries of which they are in some sense the reservoirs; some in a labyrinth, as those of the Island of Bourbon, when they are on the summit of a hemisphere, from whence they are destined to distribute the waters of Heaven in every direction; others in the form of a comb, when they are placed on the extended crest of a chain of mountains, as the pointed peaks of the chain of Taurus and of the Cordeliers; others grouped into pairs, into threes, according to the configuration of the territory which they are to water. They are of so many forms, and of different constructions: some of them are incrustations of earth, as those of the Plain of the Cafres, and of some of the Antilles Islands, and which are besides so steep as to be entirely inaccessible. Those incrustations of earth demonstrate that they have at once fossil and hydraulic attractions.

There are others which present long needles of solid

solid and naked rock; others are of a conical form; others are flattened as a table, such as that of Table-mountain at the Cape of Good-Hope, where you may frequently see the clouds accumulate and spread like a table-cloth. Some are not apparent, but entirely involved in the side of mountains or in the bosom of plains. They are all distinguishable by the fogs which they attract around them, and by the sources which emit their streams in the vicinity. Nay you may rest assured that there is no source but in the neighbourhood of some quarry of hydro-attractive, and for the most part of metallic stone. I ascribe the attraction of those peaks to the vitreous and metallic bodies of which they are composed: and I am persuaded it might be possible to imitate this architecture of Nature, and to form by means of the attraction of such stones, fountains of water in the most parched situations. In general vitreous bodies and stones susceptible of polish are very proper for this purpose; for it is observable that when water is diffused in great quantities through the air, as at the time of a general thaw, it is first attracted, and attaches itself to the glass-windows and the polished stones of our houses.

I have frequently seen on the summit of the mountains in the Isle of France, effects similar to those of the peaks of the Plain of the Cafres in the Island of Bourbon. The clouds collect there incessantly around their peaks which aresteepand pointed like pyramids. Some of those peaks terminate in a rock of a cubical form, which crowns them like a chapiter. Such is that which they call *Piterbooth*, after

after the name of a Dutch Admiral; it is one of the loftiest in the Island.

Those peaks are formed of solid rock, vitrifiable and mixed with copper: they are real electrical needles both in form and substance. The clouds perceptibly deviate from their course to collect upon them, and there accumulate sometimes to such a degree that the pinnacles become totally invisible. They thence descend into the cavity of the vallies, along the declivities of the forests, which likewise attract them, and there dissolve into rain, frequently forming rainbows on the verdure of the trees. This vegetable attraction of the forests of that island is in such perfect harmony with the metallic attraction of the peaks of it's mountains, that a field situated in an open place in their vicinity very often suffers for want of rain, whereas it rains the whole year round in the woods, which are not above a gun-shot distant. It was by the destruction of part of the trees that clothed the heights of the island that most of the brooks which watered it have been dried up: and now nothing remains of them but the empty channel.

To the same injudicious management I ascribe the sensible diminution of a considerable part of the rivers of Europe both great and small; as is evident from a simple inspection of their ancient bed, which is much broader and deeper than the mass of water at this day transmitted by them to the Ocean. Nay I am persuaded that to this cause we must ascribe the dryness of the more elevated provinces of Asia, those of Persia in particular, the mountains of which have no doubt been judiciously stripped of their trees by the

first

first tribes who inhabited them. I am decidedly of opinion, that were we to plant in France mountain-loving trees on the high grounds, and at the sources of our rivers, their ancient volume of water might be restored, and many rivulets might be made to re-assume their current through our plains, though they have a long time since ceased to flow. It is neither among the reeds nor in the depth of the valley that the Naiads conceal their exhaustless urns, as Painters represent them, but at the summit of rocks crowned with wood and towering to the Heavens.

There is not a single vegetable, the leaf of which is disposed to receive the rain-water on the mountains, whose seed is not formed in a manner the best adapted to raise itself thither. The seeds of all mountain-plants are volatile. By inspecting their leaves it is possible to ascertain the character of their grains, and by inspecting the grains that of their leaves, and thence to infer the elementary character of the plant. By mountain-plants I here wish to be understood to mean all those which grow in sandy and parched situations, on hillocks, in rocks, on steep ridges by the highway's side, in walls, and in one word, at a distance from water.

The seeds of thistles, of blue bottles, of dandelion, of succory, and many others, are furnished with pinions, with plumes, with tufts, and various other means of rising, which convey them to prodigious distances. Those of the grasses, which likewise travel very far, are provided with a light chaffy coat, and with bearded husks. Others, such as those of the yellow gilly-flower, are cut into thin scales, and

fly by the slightest breath of the wind, and plant themselves in the most inconsiderable crevice of a wall. The seeds of the largest mountain-trees are no less volatile. That of the maple has two membranous pinions similar to the wings of a fly. That of the elm is cased in the midst of an oval thin leaf. Those of the cypress are almost imperceptible. Those of the cedar are terminated by broad and thin plates, which in their aggregated state compose a cone. The grains are in the centre of the cone; and when arrived at maturity, the thin membranes to which they adhere separate from each other like the cards in a pack, and each of them flies off with it's own little kernel. *(See the annexed Plate.)*

The seeds of mountain-plants which appear too heavy for flying, are furnished with other resources. The pease of the balsamine have pods whose elasticity darts them to a considerable distance. There is likewise a tree in India, the name of which I do not now recollect, that in like manner discharges it's seeds with a noise like that of a musket fired off. Those which have neither tufts, nor pinions, nor springs, and which from their weight seemed condemned to remain at the foot of the vegetable which produced them, are in very many cases those which travel the farthest. They fly off with the wings of a bird. It is thus that a multitude of berries and shell-fruits resow themselves. Their seeds are inclosed in stony incrustations not incapable of being digested. They are swallowed by the birds, who carry them off and plant them in the cornices of towers, in the clefts of rocks, on the trunks of trees, beyond rivers, nay beyond

yond oceans. By such means it was that a bird of the Moluccas re-peopled with the nutmeg plant, the desert islands of that archipelago, in defiance of all the efforts of the Dutch, who destroy those trees in every place where they cannot be subservient to their own commerce.

This is not the place for bringing forward the relations which vegetables have to animals. It is sufficient to observe as we go along that most birds resow the vegetable which feeds them. Nay we find, without going from home, quadrupeds which convey to a great distance the seeds of the grasses. Such among others as do not chew the cud, horses for instance, whose dung is hurtful to the meadows, for an obvious reason, they introduce into them a variety of foreign herbs, as the heath and the short furze, the seeds of which they are unable to digest. They resow, besides, a great many others, which adhere to their hair, by the motion of their tail simply. There are quadrupeds of small size, such as the dormouse, the hedge-hog, and the marmot, which convey to the most elevated regions of the mountains, acorns, beech-mast, and chestnuts.

It is singularly worthy of remark that volatile seeds are produced in much greater number than those of other species; and in this we are called upon to admire the intelligence of that Providence which foresaw every thing, and arranged all accordingly. The elevated situations for which they are destined, were exposed to be speedily stripped of their vegetables, by the declivity of their soil, and by the rains, which have a continual tendency to lower them. By means

of the volatility of grains, they are become of all the places of the Earth the most prolific in plants. In the mountains is deposited the Botanist's treasure.

It cannot be too frequently repeated, The remedies provided by Nature always surmount the obstacles which she has opposed; and her compensations ever exceed her gifts. In truth, if you except the inconveniences of declivity, a mountain presents to plants the greatest variety of exposures. In a plain they have the same Sun, the same degree of humidity, the same soil, the same wind; but if you ascend a mountain, situated in our Latitude only twenty-five fathoms of perpendicular height, you change your climate as much as if you had travelled twenty-five leagues northward; so that a mountain of twelve hundred fathoms perpendicular height, would present us with a scale of vegetation as extensive as that of twelve hundred leagues along the Horizon, which is nearly our distance from the Pole: both the one and the other would terminate in a region of perpetual ice. Every step we take upon a mountain, whether ascending or descending, gives us a change of Latitude; and if we encompass it round and round, every step changes our Longitude. We shall fall in with points where the Sun rises at eight o'clock in the morning; others at ten o'clock; others at noon. We should find an infinite variety of exposures; of cold toward the North, of heat to the South, of rain to the West, of drought to the East; without taking into the account the different reflections of heat in sands, rocks, bottoms of vallies, and lakes, which modify them a thousand various ways.

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We must proceed farther to observe; and who can do it without profound admiration? that the season of the maturity of most volatile seeds takes place toward the commencement of Autumn; and that from an effect of the universal Intelligence, which constrains all the parts of Nature to act in concert. Then it is that we have the most violent gales of wind, about the end of September, or beginning of October, called the equinoctial winds. These winds blow in all parts of the Continents, from the bosom of the seas to the mountains which are in correspondence with them. Not only do they convey thither the volatile grains which have then attained to a state of maturity, but likewise blend with these thick clouds of dust, which they carry off from lands dried up by the burning heats of Summer, and particularly from the shores of the Sea, where the incessant motion of the billows, which there break, and continually toss the pebbly strand backward and forward, reduce the hardest bodies to an impalpable powder.

Those emanations of dust are in many places so copious, that I could produce a variety of instances of vessels covered with them, as they were crossing gulfs, though more than six leagues distant from land. They are so troublesome in the loftier provinces of Asia, that all travellers who have visited Pekin assure us it is impossible to walk the streets of that city, for a considerable part of the year, without having the face veiled. Thus there are rains of dust which repair the summits of the mountains, as there are rains of water which feed their sources. Both the one and the other issue from the Sea, and return to it by the

course of the rivers, which are perpetually conveying thither their constant tribute of waters and sands. The maritime winds unite their efforts toward the autumnal equinox, transport from the circumference of the Continents, to mountains the most remote from them, the seeds and the manure which had flowed from thence, and sow meadows, groves, and forests on the sides of precipices, and on the most inaccessible peaks. Thus the leaves, the stems, the seeds, the birds, the seasons, the seas, and the winds, concur in a wonderful manner to keep up the vegetation of the mountains.

I have been mentioning the relations of plants to mountains; I am mortified that it is not in my power here to insert the relations which mountains themselves have with plants, according to my original intention. All that I can at present say on this subject is, that so far are mountains from being the productions of a centrifugal force, or of fire, or of earthquakes, or of water courses, I know of at least ten different species, each of which has a configuration the most perfectly adapted for keeping up in every particular Latitude the harmony of the elements relatively to vegetation. Each of them has moreover vegetables and quadrupeds peculiar to itself, and which are not elsewhere to be found. This proves to a demonstration that they are not the work of chance. Finally, among that inconceivable number of mountains which cover the greatest part of the five Zones, and especially the Torrid and the Icy Zones, there is but one single species, the least considerable of all, which presents to the water-courses projecting and retreating

retreating angles in correspondence. This however is no more their work than the bason of the seas is itself the work of the Ocean. But this interesting subject, of an extent too considerable to admit of it's being here introduced, belongs, besides, to the province of Geography.

Let us now proceed to display the harmony of aquatic plants.

These have dispositions entirely different in their leaves, the bearing of their branches, and above all in the configuration of their seeds. Nature, as has already been observed, in order to vary her harmonies, only employs in very many cases positive and negative characters. She has bestowed an aqueduct on the pedicle of the leaves of mountain-plants; she withdraws it from those which grow by the side of the waters, and transforms them into aquatic plants. These, instead of having their leaves hollowed out into gutters, are clothed with leaves smooth and sleek, such as the corn flag, which bears them in form of a poignard's blade, or swelling in the middle like a sword blade, as those of the species of reed called typha, that common sort, the stem of which the Jews put into the hand of Jesus Christ. Those of the nymphæ or plane, and rounded in form of a heart. Some of these species affect their forms, but their long tails are uniformly destitute of a canal. Those of the bulrush are round like a pipe. There is an endless variety of rushes on the brink of morasses, rivulets, and fountains. You will find them of all sizes, from those which have the fineness of a hair up to the species which grow in the river of Genoa as large as a

cane. Whatever difference there may be in the jointing of their stalks and of their pannicles, they all have in their plan a round or elliptical form. You will find those species alone which grow in parched situations to be fluted and hollowed on their surface. When nature intends to render aquatic plants susceptible of vegetation on the mountains, she bestows aqueducts on their leaves; but when on the contrary she means to place mountain-plants by the water's-side, she withdraws it. The aloës of the rock has it's leaves hollowed into a scoop; the aloës of the water has them full. I am acquainted with a dozen species of mountain-fern, every one of which has a small fluting along it's branches, and the only species of the marshes which I know wants it. The bearing of it's branches is likewise very different from that of the others. The first rears them toward Heaven, the last bears them almost horizontally.

If the leaves of mountain-plants are constructed in the best manner possible for collecting at their roots the waters of Heaven, which they have not always at command; those of aquatic plants are frequently disposed in such a manner as to remove them, because they are destined to grow in the bosom of water, or in it's vicinity. The leaves of trees which love the water's side, as the birch, the aspin, and the poplar, are attached to long and pendent tails. There are others which bear their leaves disposed in form of tiles, as the great chestnut of India and the walnut. Those of plants which grow in the shade, around the trunk of trees, and which derive by their roots the humidity collected by the foliage of the tree, as the

french-bean and the convolvulus, have a similar bearing. But those which grow entirely under the shade of trees, and which have scarcely any roots, as mushrooms, have leaves that so far from pointing toward Heaven are turned downward to the earth. The greatest part are formed on the upper side into a thick parasol, to prevent the Sun from drinking up the moisture of the soil in which they grow; and they are divided on the under side into thin leafy plates, for receiving the vapours which exhale from the ground, nearly as those of the horizontal wheel of a fire-engine receives the steam of the boiling water which makes it to turn about. They have besides several other means of watering themselves by these exhalations. There are many numerous species lined with tubes, others are stuffed with sponges. There are some whose pedicle is hollow inwardly, and which bearing a chapter a-top, there collect the emanations of their soil as in an alembic. Thus there is not a particle of vapour in the Universe that goes to waste.

What has just now been said of the inverted forms of mushrooms, of their leafy plates, of the tubes and sponges with which they are lined, for receiving the vapours exhaled from the ground, confirms what was advanced respecting the use of the leaves of mountain-plants hollowed into gutters, or constructed into the form of a pencil, or of a fan, for receiving the waters of Heaven. But aquatic plants which had no need of such recipients, because they thrive in water, have, if I may so express myself, a repulsive foliage. I shall here present an object of comparison, calculated to produce conviction of the truth of those prin-

ciples; for example, the mountain-box-tree and the caper-plant of the rocks have their leaves hollowed into a spoon form, with the concavity turned toward Heaven; but the vaccinium of the marshes, (cranberry) or *vaccinia palustris*, which is likewise furnished with concave leaves, bears them inverted, with the cavity turned toward the earth. From this negative character, I was enabled to distinguish, as a plant of the marshes, a very rare plant in the Royal Garden, which I saw for the first time. It is the *lætum palustre*, which grows in the marshes of the Labrador country. It's leaves, formed like little coffee-spoons, are all inverted; their convex side being turned toward Heaven. The water-lentil of our marshes, as well as the typha of our rivers, has the middle of it's leaf swelled.

Botanists, on observing leaves nearly similar to plants on the brink of the water, and on the heights of mountains, never entertained a suspicion that they could answer purposes so different. Many of them no doubt are persons of profound erudition; but their learning is rendered entirely useless to them, because their method constrains them to proceed in one single track, and their system indicates to them only one kind of observations. This is the reason that their most numerous collections frequently present nothing but a mere vocabulary. The Study of Nature is spirit and intelligence simply. Her vegetable order is an immense volume, of which plants form the thoughts, and the leaves of those very plants the letters. Nay there is not a very great number of primitive forms in the characters of this alphabet: but

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by means of their various assemblages she forms, as we do with ours, an infinite number of different thoughts. As it is with language, in order totally to alter the meaning of an expression, all that she has in many cases to do is to change an accent. She places rushes, reeds, arums with a sleek foliage and a full pedicle, on the banks of rivers: she traces an aqueduct in the leaf, and transforms them into rushes, reeds, and arums of the mountains.

We must at the same time be carefully on our guard against generalizing those means; otherwise they will quickly betray us into a misapprehension of her procedure. For example, certain Botanists having suspected that the leaves of some plants might very well be adapted for collecting the rain water, believed that they had a perception of this use in that of the *dipsacus*, or fullers-thistle. It was very easy to fall into a mistake here, for the leaves are opposite, and meet at their bases; so that after it has rained they present reservoirs, which contain one with another a good half-glass of water, and which are disposed in stories along it's stem. But they ought to have considered, first, that the *dipsacus* grows naturally on the brink of waters, and that Nature does not bestow cisterns of water on aquatic plants. This would be, according to the proverb, to carry water to the river. Secondly, they might have observed that the tiers formed by the opposite leaves of the *dipsacus*, so far from being reservoirs, are on the contrary dischargers, which convey off the rain water from it's roots, to the distance of nine or ten inches on every side by the extremities of it's leaves. They resemble,

resemble, in some respects, the gutters which project from the roofs of our houses, or those which are formed by the corners of our hats, which serve to carry away the rain water from the body and not to throw it inward. Besides, the water which remains in the cavity of the leaves of the *dipsacus* never can get down to the root of the plant, for it is detained there as at the bottom of a vase. It would not even be proper for moistening it, for *Pliny* insists that it is brackish. The birch-wort which grows in the trembling and frothy marshes of Canada, carries at it's base two leaves, formed like the halves of a trumpet sawed asunder lengthwise. They are both concave, but have at the extremity that is farthest from the plant a kind of bill shaped like a spout. The water which remains in the receivers of these aquatic plants, is perhaps destined to supply drink to the small birds, which sometimes find themselves not a little embarrassed how to come at it in the time of inundations.

It is necessary carefully to make a distinction between the elementary and the relative characters of plants. Nature obliges the man who studies her not to hold to external appearances, and in order to form his understanding, she makes him rise from the means which she employs to the ends which she proposes. If certain aquatic plants seem to present in their foliage some of the characters of mountaineers, there are upon the mountains some which seem to present characters similar to those of the waters; such, for example, is the broom. It bears leaves so small and so few in number, that they appear insufficient for collecting the water necessary to it's growth, and so much

much the more that it thrives in soils the most parched. Nature has indemnified it in another manner. If it's leaves are small it's roots are very long. They go in quest of coolness to a great distance. I have seen some of them extracted from the earth, which were more than twenty feet in length, and it was necessary after all to break them off, it being impossible to reach the extremities. This prevents not the scanty leaves from exhibiting the mountain-character; for they are concave, they point toward Heaven, and are lengthened out like the under bill of a bird.

The greatest part of aquatic vegetables throw the water off from them, some by their port; such as the birch, the branches of which, so far from rearing themselves toward heaven, fall downward in form of an arch. The same thing may be affirmed of the great chestnut and of the walnut, unless these trees should have changed their natural attitude by growing in thirsty situations. Their bark is usually sleek, as that of the birch, or scaly like that of the chestnut; but not hollowed into canals, as that of the elm or the mountain pine. Others have in themselves a repulsive quality: such are the leaves of the nymphæa, and of several species of colewort, on which the drops of water collect into globules like the particles of quicksilver. Nay there are some which it is extremely difficult to moisten, such as the stems of many species of capillary plants. The laurel, we are told, carries it's repulsive quality to such a degree as to repel the thunder. If this quality so highly extolled by the Ancients, is really possessed by the laurel, we must undoubtedly ascribe this to it's nature

as

as a fluviatic plant. The laurel grows in abundance on the banks of the rivers of Thessaly. A traveller, whose name is the *Sieur de la Guilletiere*,* says, in a relation written in a very lively and agreeable manner, that he never saw any where such fine laurels as along the side of the river Peneus. Hence perhaps was suggested the idea of the metamorphosis of *Daphne*, the daughter of that river-deity, transformed by *Apollo* into a laurel.

This repulsive property of certain trees, and of some aquatic plants, induces me to think that they might be employed around our habitations, as a security against thunder-storms, and that in a manner more certain, and much more agreeable than electrical conductors, which dissipate only by attracting them to the neighbourhood. They might farther be very advantageously employed for drying marshy grounds: as the attractive qualities of many mountain-vegetables might be used in forming fountains upon heights, by collecting there the vapours which float in the air. There is not perhaps an infectious morass on the Globe, except in places where men have injudiciously destroyed the plants whose roots absorbed the humidity of the Earth, and whose foliage repelled that of the Heavens.

I pretend not to affirm however that the foliage of aquatic plants has no farther uses: for where is the man who has entered into the endless views of Nature? "To whom hath the root of wisdom been "revealed? or who hath known her wise counsels?" *Radix sapientiæ cui revelata est? et astutius illius quis*

* See the Voyage to Lacedemon, by the *Sieur de la Guilletière*.

agnovit?

*agnovit?** In general, the leaves of aquatic plants appear, from their extreme mobility, very much adapted to the purpose of renewing the air of humid places, and of producing by their movements, that drying of the ground to which I have just alluded. Such are those of reeds, of poplars, of aspins, of birches, and even of willows, which are sometimes in motion though there is not the slightest degree of wind perceptible.

It is farther remarkable that most of these vegetables emit a very pleasing smell; among others, the poplar and the birch, especially in the Spring: and that a great number of aromatic plants thrive by the water's-side, as mint, sweet marjoram, ciperus, the sweet-smelling rush, the iris, the *calamus aromaticus:* and in the Indies, the spice plants, such as the cinnamon-tree, the nutmeg, and the clove. Their perfumes must contribute very powerfully to diminish the mephitic exhalations which are natural to marshy and humid places. They have likewise many uses relatively to animals, such as affording a shade to the fishes which resort thither in quest of a shelter from the scorching heat of the Sun.

But one conclusion we may certainly deduce in favour of our improvements in culture from the observations now made; namely this, That in the cultivation of plants, thepedicle of whose leaves presents no impress of a canal, it is necessary to water them copiously; for in this case they are naturally aquatic. The nasturtium, the mint, and the sweet-marjoram, consume a prodigious quantity. But when plants are

* Ecclesiasticus, chap. i. ver. 6.

provided

provided with a canal, they must be watered more sparingly, for this demonstrates them to be originally natives of the mountains. The deeper this canal is the less artificial watering do they require. Every gardener knows that if you frequently water the aloës, or the taper of Peru, you kill them.

The seeds of aquatic plants have forms not less adapted than those of their leaves to the places where they are destined to grow; they are all constructed in a manner the most proper for sailing off. Some of them are fashioned into the figure of shells, others into boats, rafts, skiffs, single and double canoes, similar to those of the South-Seas. I can have no doubt that by an attentive study of this part alone, a great number of very curious discoveries might be made, respecting the art of crossing currents of every sort; and I am persuaded that the first men, who were much better observers than we are, copied their different methods of travelling by water after those models of Nature, of which we with all our pretensions to discovery are but feeble imitators.

The aquatic or maritime pine has it's kernels inclosed in a kind of little bony shoes, notched on the under side, and covered over on the upper with a piece resembling a ship's hatch. The walnut, which delights so much in the banks of rivers, has it's fruit contained in two little boats whose apertures are perfectly fitted to each other. The hasel, which becomes, so bushy on the brink of rivulets; and the olive which is enamoured of the sea-shore to such a degree that it degenerates in proportion as you remove it thence, carry their seed inclosed in a species of little casks

casks capable of holding out the longest voyages. The red berry of the yew, whose favourite residence is the cold and humid mountain by the side of a lake, is hollowed into a little bell. This berry on dropping from the tree, is at first carried down by it's fall to the bottom of the water: but it returns instantly to the surface, by means of a hole which Nature has contrived, in form of a navel, above the seed. In this aperture is lodged a bubble of air, which brings it back to the surface of the water, by a mechanism more ingenious than that of the diver's-bell in this, that the vacuum of the diving-bell is undermost, and in the berry of the yew it is uppermost.

The forms of the seeds of aquatic-plants are still more curious; for, universally, Nature redoubles her skill and exertions in favour of the little and the weak. That of the bulrush resembles a lobster's egg; that of fennel is a real canoe in miniature, hollowed in the middle, with both ends raised into a prow. There are others grooved into each other, resembling pieces of wood disposed for a float and worm-eaten; such are those of the horned poppy. Those which are destined to thrive on the brink of waters destitute of current are wafted by sails; such is the seed of a scabious plant of our own country which grows on the border of morasses. Besides the difference of this from the other species of scabious, whose seeds are crowned with pronged hairs, in order to fasten themselves on the hairs of the animals which transplant them, the one last-mentioned is overtopped by a half-bladder, open and resting on it's summit like a gondola.

dola. This half-bladder serves it at once as a sail by water, and as a vehicle by land. These means of natation, though endlessly varied, are common in all climates to the grains of aquatic plants.

The almond of the river of the Amazons, known by the name of *totoca*, is inclosed in two shells, exactly similar to those of an oyster. Another fruit on the strand of the same river, which abounds in almond-trees, has a perfect resemblance in colour and form to an earthen pot, with it's little lid;* it goes by the name of the monkey's porridge-pot. Others are formed into large bottles as the fruit of the great gourd. There are seeds incrusted in a coat of wax, which makes them float, such are the berries of the wax-tree, or royal pimenta of the shores of Louisiana. The formidable apple of the mancenilla, which grows on the sea-shore of the islands situated between the Tropics, and the fruit of the manglier, which grows there actually in the salt water, are almost ligneous. There are others with shells similar to the sea-urchin, without prickles. Many are coupled and perform their voyage like the double canoe, or balse, of the South-Sea. Such is the double cocoa of the Sechelles Islands.

If you examine the leaves, the stems, the attitudes, and the seeds of aquatic plants, you will always remark in them characters relative to the places where they are destined to grow, and in harmony with each other; so that if the seed has a nautical form, it's

* See engravings of most of those seeds, in *John de Laet's* History of the West-Indies.

leaves

leaves are deprived of an aqueduct; just as in mountain-plants, if the grain is volatile, the pedicle of the leaf, or the leaf altogether, presents a channel.

I shall assume, as an instance of the nautical harmonies of plants, the nasturtium, with which every one is acquainted. This plant which bears flowers so agreeable, is one of the cresses of the rivulets of Peru. It must be observed first, that the foot-stalks of it's leaves have no conduit, like those of all aquatic plants; they are inserted in the middle of the leaf which they support like an umbrella, to ward off from them the water which falls from Heaven. It's seed when fresh has exactly the form of a boat. The upper part is raised into a slope like a bridge to let the water run off; and you distinguish perfectly in the lower part a poop and a prow, a keel and a bottom. *(See the annexed Plate.)* The little furrows of the seed of the nasturtium are characters common to most nautical grains, as well as the triangular forms, and those of the kidney or keel. Those furrows undoubtedly prevent them from rolling about in all directions, constrain them to floating along lengthwise, and give them the direction the best adapted to the track of the water, and to the passage of the narrowest straits. But they have a character still more general; it is this, that they swim in their state of maturity, which is not the case with grains destined to grow in the plains, such as pease and lentils, which sink to the bottom.

Some species of these nevertheless, such as the french-bean, sink at first to the bottom, and rise to the surface when penetrated with the water. Others,

on the contrary, float at first and sink afterward. Such is the Egyptian bean, or the seed of the colochasia, which grows in the waters of the Nile. In order to sow it you are under the necessity of rolling it up in a ball of earth, and in that state it is thrown into the water. Without this precaution not one would remain on the shores where you would wish it to grow. The natability of aquatic seeds is undoubtedly proportioned to the length of the voyages which they have to perform, and to the different gravity of the waters in which they are destined to swim. There are some which float in sea-water and sink in fresh, which is lighter than sea-water by one thirty-second part: such precision is in the balancing of Nature! I believe that the fruit of the great India chesnut, which thrives on the shores of the salt creeks of Virginia, are in this situation. In a word, I am so entirely convinced of all the relations which Nature has established among her Works, as to conclude, that the time when the seeds of aquatic plants drop, is regulated in most cases by that of the overflowing of the rivers where they grow.

It is a speculation well worthy of the attention of the philosophic mind, to trace those vegetable fleets sailing along night and day with the current of the rivulets, and arriving, undirected by any pilot, on unknown regions. There are some which, by the overflowing of the waters, now and then lose themselves in the plains. I have seen them sometimes accumulated upon each other in the bed of torrents, presenting around the pebbles where they had germinated, waves of verdure of the most beautiful sea-

green.

green. You would have thought that *Flora*, pursued by some River god, had dropt her basket in the urn of the deity. Others more fortunate, issuing from the sources of some stream, are caught by the current of the great rivers, and conveyed away to embellish their distant banks with a verdure not their own.

There are some which cross the vast Ocean; and after a long navigation are driven by the very tempests on the regions which they adorn and enrich. Such are the double cocoas of the Sechelles or Mahé Islands, which the Sea carries regularly every year a distance of four hundred leagues, and lands them on the coast of Malabar. The Indians who inhabit it were long under the persuasion, that those annual presents of the Ocean must have been the produce of palm-trees that grow under it's billows. They gave them the name of marine cocoa-nuts; and ascribed wonderful virtues to them. They set as high a value upon them as upon ambergris; and to such a pitch was this extravagance carried, that many of those fruits have been sold as high as a thousand crowns a-piece. But the French having some years ago discovered the Island of Mahé, which produces them, and which is situated in the fiftieth degree of South-Latitude, imported them in such quantities to India, that they sunk at once in value and in reputation; for men in every country prize those things only which are rare and mysterious.

In every island where the eye of the traveller has been able to contemplate the primordial dispositions of Nature, he has found their shores covered with

vegetables, all the fruits of which possess nautical characters. *James Cartier* and *Champlain*, represent the strands of the lakes of North-America as shaded by stately walnut-trees. *Homer*, who has so attentively studied Nature, at times when, and in places where she still retained her virgin beauty, has planted the wild-olive along the shores of the island on which *Ulysses*, floating upon a raft, is thrown by the tempest. The navigators who have made the first discoveries in the seas of the East-Indies, frequently found in them shallows planted with cocoa-trees. The Sea throws such quantities of fennel-seed on the shores of Madeira, that one of it's bays has obtained the name of Funchal, or Fennel-Bay.

It was by the course of those nautical seeds, too carelessly observed by modern Seamen, that the Savages formerly discovered the islands to windward of the countries which they inhabited. They formed conjectures respecting a tree at a great distance, on seeing it's fruit cast upon their shores. By similar indications *Christopher Columbus* acquired the assurance that another world existed. But the regular winds and currents from the East, in the South-Sea, had carried them long before to the Nations of Asia; of which I shall say something toward the end of this Study.

There are besides vegetables of an amphibious nature. They are disposed in such a manner, that one part of their foliage raises itself toward Heaven, and the other forms an arcade and bends downward to the ground. Nature has given to their seeds likewise the power of at once flying and swimming.

Such

Such is the willow, the seed of which is enveloped in a cobweb down, which the winds transport to a great distance, and which floats along the surface of the water, without wetting itself, like the downy feathers of the duck. This down is composed of small capsules like the bottom of a lamp, and with two beaks filled with seeds, which are covered with a plume; so that the wind conveys those capsules through the air, and likewise transports them by sailing along the face of the water. This configuration was admirably adapted to the vehicles of the seeds of plants which grow by the side of stagnant waters and lakes. The same thing holds as to the seeds of the poplar; but those of the alder which grows on the banks of rivers have no plumage, because the current of the stream is designed to convey them from place to place.

The seed of the fir and of the birch have at once volatile and nautical characters; for the fir has it's kernel attached to a membranous wing; and the birch has it's grain embraced by two wings, which give it the appearance of a little shell. These trees grow at once on the wintry mountains and on the margin of the lakes of the North; their seeds had occasion not only to sail over stagnant waters, but to be transported through the air over the snows, in the midst of which they take delight. I have no doubt that there may be species of these trees the seeds of which are altogether nautical. Those of the linden-tree are carried in a spherical body similar to a little bullet. This bullet is affixed to a long tail, from the extremity of which descends obliquely a follicle of considerable length, whereby the wind carries it away

to a great distance, spinning it round and round. When it drops into the water it plunges about the length of an inch, and serves in some sort as ballas to it's tail, and to the little leaf attached to it, which being thus brought to a vertical situation, perform the functions of a mast and sail. But the examination of so many curious varieties would carry me too far.

This would be the proper place to speak of the roots of vegetables; but I am little acquainted with what passes under ground. Besides in all Latitudes, on heights as well as by the water's-side, we find the same substances nearly, muds, sands, pure mould, rock, which must produce a much greater resemblance in the roots of plants than in the other parts of their vegetation. I have no doubt however that Nature has established on this subject relations, the knowledge of which would be highly useful, and that a cultivator somewhat experienced might be able, by inspecting the root of a vegetable, to determine the species of soil best adapted to it. Those which are very hairy seem most proper for sandy grounds. The cocoa-tree, which grows to a very large size on the shores of the Torrid Zone, thrives in pure sand, which it interlaces with such a prodigious quantity of hairy fibres, as to form a solid mass around it. It is on this basis that it effectually resists the most violent tempests in the midst of a moving soil. What is singularly remarkable in the case of this plant, it never succeeds so well as in the sand on the sea-shore, and generally languishes in the interior of a country.

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The Maldivia Islands, which are for the most part nothing but sandy shallows, are the most renowned regions of all Asia for the abundance and the beauty of their cocoa trees. There are other vegetables of the shores, the roots of which are drawn out like cords. This configuration renders them exceedingly proper for binding together the ground, and thereby defending it against the inroads of the watery element. Such are among ourselves the alder, the reed, but above all a species of dog-grass, which I have seen very carefully cultivated in Holland along the dikes.

Bulbous plants appear in like manner to take pleasure in soft muds, into which they cannot penetrate very far from the roundness of their bulbs. But the elm extends it's roots at pleasure on the declivity of the mountain; and the oak inserts his sturdy pivots into it, to lay hold of the successive strata of which it is composed. Other plants preserve on the high grounds, by their creeping foliage and their superficial roots, the emanations of dust which the winds there deposit. Such is the *anemone nemerosa*. If you find a single foot of it on a hill, in a wood not greatly frequented, you may rest assured that it diffuses itself like a net-work through the whole extent of that wood.

There are trees, the trunks and the roots of which are admirably constructed with obstacles which appear to us accidental, but which provident Nature foresaw. For example, the cypress of Louisiana, grows with it's foot in the water, chiefly on the banks of the Mechassippi, whose vast shores it magnificently shades.

shades. It rises there to a height which surpasses that of almost any of the trees of Europe:* Nature has given to the trunk of this stately tree a circumference of more than thirty feet, to enable it to resist the ices from the lakes of the North, which discharge themselves into that river, and the prodigious rafts of timber which float down it's stream, and which have obstructed most of it's mouths to such a degree as to interrupt the navigation to vessels of any considerable burthen. And to put it beyond a doubt that she designed the thickness of it's trunk for withstanding the shock of floating bodies, it is remarkable that at the height of six feet she suddenly diminishes the size of it at least a third, the full magnitude having become superfluous at that degree of elevation: and for the purpose of a securing it in another manner still more advantageous, she raises out of the root of the tree at four or five feet distance all around, several large stumps from one foot to four feet high. These are not shoots, for their head is smooth, and bears neither leaves nor branches: they are real ice-breakers.

The tupelo, another great tree of Carolina, which grows likewise by the water's side, but in creeks, has nearly the same dimensions at it's base, excepting the ice-breakers or palisades. The seeds of those trees are fluted, as I have already observed to be the case with aquatic seeds in general; and that of the cypress of Louisiana differs considerably, by it's nautical form, from that of the cypress of the mountains of Europe, which is volatile. These observations are so

* See Father *Charlevoix*, his History of new France, vol. iv.

much

much the more worthy of credit, that Father *Charlevoix*, who in part relates them, deduces no consequence whatever from the facts, though he was abundantly capable of interpreting their use.

It must now be apparent of what importance it is to connect the study of plants with that of the other Works of Nature. It is possible to ascertain by their flowers the exposure to the Sun which is best adapted to them; by their leaves the quantity of water that is necessary to vegetation; by their roots, the soil which is most suitable; and by their fruits, the situations in which they ought to be placed, together with new relations to the animals which feed upon them. By fruit I mean, as Botanists likewise do, seed of every species.

The fruit is the principal character of the plant. Of this we may form a judgment, first from the care which Nature has bestowed on it's formation and preservation. It is the ultimate term of her productions. If you examine in a vegetable the different envelopes which enclose it's leaves, it's flowers, and it's fruits, you will perceive a most wonderful progression of pains and precautions. The simple leaf-buds are easily distinguishable from the simplicity of their cases. Nay there are plants which have none at all, as the shoots of the gramineous, which start immediately out of the earth, and stand in no need of any foreign protection. But the buds which contain flowers are provided with sheaths, or lined with down, as those of the apple-tree; or cased over with glue externally, as those of the great India chesnut; or are inclosed in bags, as the flowers of the narcissus;

cissus; or secured in some way or another, so as to be very distinguishable even before their expansion.

You afterwards perceive that the care employed in dressing out the flower was entirely destined to the fecundation of the fruit; and that when this is once formed, Nature redoubles her precautions, both externally and internally, for it's preservation. She gives it a placenta, she envelopes it in pellicles, in shells, in pulps, in pods, in capsules, in husks, in skins, and sometimes in a case of thorns. A mother cannot pay more attention to the cradle of her infant. In process of time, in order that her grown child may be enabled to go abroad, and look for a settlement in the world, she crowns it with a tuft of plumage, or incloses it in a shell: furnishes it with wings to fly away through the air, or with a bark to sail off along the face of the water.

There is something still more marked to arrest our observation in favour of the fruit. It is this, that Nature frequently varies the leaves, the flowers, the stems and the roots of a plant; but the fruit remains constantly the same, if not as to it's form, at least as to it's essential substance. I am persuaded that when she was pleased to create a fruit, it was her intention that it should have the power of re-producing itself on the mountains, in the plains, amidst rocks, in sands, on the brink of waters, and under different Latitudes; and in order to adapt it to it's situation, she varied the watering-pot, the mirror, the prop, the attitude, the buttress, and the fur of the vegetable, correspondingly to the Sun, to the rains, to the winds, and to the soil. To this intention, I believe,

I believe, we ought to ascribe the prodigious variety of species in every genus, and the degree of beauty which each attains when in the situation th at is na tural to it. Thus, in forming the chestnut to reach perfection on the stony mountains of the South of Europe, and to supply the want of corn, which scarcely ever succeeds there, she placed it on a tree which in those regions attains magnificence from it's adaptations.

I have eaten of the fruit of the chestnut-tree of the Island of Corsica. It is as large as small hen's e ggs and makes excellent food. You may read in a modern traveller the description of a chestnut tree which grew in Sicily, on one of the ridges of Mount Ætna. It's foliage is of such extent that a hundred cavaliers could repose with ease under it's shade. For that reason it obtained the name of *centum cavallo*. Father *Kircher* assures us that he had seen on the same mountain, in a place called *Trecastagne*, three chestnut-trees of such a prodigious size, that when they were felled you might have lodged a large flock of sheep under covert of their bark. The shepherds employed them for this purpose in the night-time, and in bad weather, instead of penning up their charge in the fold. Nature has granted to this stately vegetable the faculty of collecting on the steep mountains the waters of the Atmosphere, by means of leaves formed like so many tongues; and of penetrating, by means of it's sturdy roots, down to the very bed of fountains in despite of lavas and rocks.

Nature has been pleased elsewhere to produce the fruit of this tree with a degree of bitterness, for the

use

use of some animal no doubt, on the brink of the salt-water creeks and arms of the Sea in Virginia. She has bestowed on the tree which bears it's leaves disposed in form of a tile, a scaly bark, flowers different from those of the European chestnut-tree, but adapted unquestionably to the humid exhalations, and to the aspects of the Sun to which it is exposed. In a word, she has transformed it into the great India chestnut. It arrives at much greater beauty in it's native country than in Europe. That of America is the maritime chestnut-tree; and that of Europe is the chestnut-tree of the mountains. She has placed, perhaps by a different kind of combination, this fruit on the beach-tree of our hills, the mast of which is evidently a species of chestnut.

Finally, by means of one of those maternal attentions which have induced her to suspend, even on herbs, the productions of trees, and to serve up the same dishes on the smallest tables, she has placed before us the same fruit in the grain of the black corn, which in it's colour and it's triangular form resembles the seed of the beech, called in Latin *fagus*, whence this species of corn has obtained the name of *fagopyrum*. One thing at any rate is certain, namely, that independent of the mealy substance, we find in the black corn, in the beech mast, and in the chestnut, similar properties, such as that of cooling excessive heat of urine.*

It was in like manner the intention of Nature to produce the acorn in a great variety of exposures. *Pliny* enumerated in his time thirteen different spe-

* See *Chomel's* Treatise on Common Plants.

cies

cies in Europe, one of them, which makes very excellent food, is that of the green oak. It is of this that the Poets speak when they celebrate the felicity of the Golden Age, because it's fruit then served as an aliment to Man. It is worthy of being remarked that there is not a single genus of vegetable but what gives, in some one of it's species, a substance capable of being converted into nourishment for mankind. The acorn of the green oak is, among the fruits of this genus of trees, the portion reserved for our use. Nature has been pleased, after making this provision for Man, to scatter the other species of the oak over the different soils of America, to supply the necessities of her other creatures. She has preserved the fruit, and has varied the other parts of the vegetable. She has placed the acorn, but with the leaves of the willow, on the plant which has for that reason got the name of the willow-leafed oak, and which thrives in that country by the water's-side.* She has placed it together with small and pendent leaves affixed to pliant tails like those of the aspin, on the water oak, which grows there in the marshes. But when she intended to plant them in dry and parched soils, she united to them leaves of ten inches in breadth, adapted to the reception of rain-water, such are those of the species known by the name of the black oak in that country.

It may be necessary farther to observe, that the place where any species of plant produces the finest fruit, determines it's principal genus. Accordingly,

* See the figures of it in Father *Charlevoix*, his History of New France, vol. iv.

though

though the oak has it's species scattered about every where, it must be considered as of the genus of mountain-trees; because that which grows on the mountains of America, and there distinguished by the name of the chestnut-leafed oak, yields the largest acorns, and is one of the greatest-trees in that part of the world; whereas the water-oak and the willow-leafed oak rise to no great height, and produce very small acorns.

The fruit, as we have seen, is the invisible character of the plant. To it, accordingly, Nature has likewise attached the principal relations of the animal kingdom to the vegetable. It was her intention that an animal of the mountains should find the fruit on which he has been accustomed to live in the plains, on the sand, among the rocks, when he is under the necessity of changing his country, and especially on the brinks of rivers, when he descends thither to quench his thirst. I am not acquainted with a single mountain-plant but what has some of it's species, with their corresponding varieties scattered over all situations, but principally on the margin of waters.

The mountain pine has it's kernels mounted on wings, and the aquatic pine has it's seed inclosed in a skiff. The seeds of the thistles which grow on parched soil, are furnished with plumes to convey them from place to place; those of the fullers-thistle, which thrives by the water's-side, have none, because they had no occasion for any to assist them in swimming. Their flowers vary for similar reasons; and though Botanists have two different genera of them,

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the goldfinch fails not to acknowledge this last as a real thistle. He rests himself upon it when he finds it convenient to go and cool himself on some watery bank. He forgets, on beholding his favourite plant, the sandy downs where he was born, and cheers the banks of the rivulet with the music of his song, and the beauty of his plumage.

It appears to me impossible to acquire any thing like a knowledge of plants unless by studying their geography and their ephemeris. Without this double illumination, which mutually reflects, their forms will be for ever strange to us. The greatest part of Botanists however pay no manner of regard to this. In making their collections, they remark not the season at which plants grow, nor the place where, nor the aspect to which they are exposed. They carefully attend to all their intrinsic parts, and especially to their flowers; and after this mechanical examination, deposit them in their herbary, and imagine they have a thorough knowledge of them, especially if they have had the good fortune to dignify them by imposing some Greek name. They resemble a certain hussar of whom I have heard, who having happened to find a Latin inscription in characters of bronze, on an antique monument, disengaged them one after another, and tumbled them together into a basket, which he dispatched to an Antiquarian of his friends, with a request that he would inform him what they meant. They no more lead us to an acquaintance with Nature, than a Grammarian would give us a relish for the genius of *Sophocles*, by presenting us with a naked catalogue of his tragedies,

of

of the division of their acts and scenes, and of the number of verses which compose them. With equal absurdity are they chargeable who collect plants, without marking their relations to each other, and to the elements; they scrupulously preserve the letter, but suppress the sense. Far different was the manner in which a *Tournefort*, a *Vaillant*, a *Linnæus*, prosecuted the study of Botany. If these learned men have not deduced any consequence from those relations, they have at least prepared the projecting stones of expectation, which promise the construction of a future fabric of science.

Though the observations which I have just made respecting the elementary harmonies of plants, are but few in number, I have the confidence to affirm that they are of very high importance to the progress of agriculture. The point in question is not to determine geometrically the genera of flowers, whose mirrors are the best adapted for reflecting the rays of the Sun in every point of Latitude; the glory of calculating their curves is reserved for future *Newtons*. Nature has outrun our most ardent wishes in those places where she has been left at liberty to re-establish her own plans. We have it in our power to secure prosperity to ours, in a manner the most beneficial, by reducing them into harmony with her's. In order to ascertain what plants are best adapted to succeed in such and such a district, you have only to pay attention to the wild plants which thrive there spontaneously, and which are distinguishable for their vigor and for their multitude: then substitute in their place domestic plants, which have the same kind of

flowers

flowers and leaves. Wherever umbelliferous plants grow, you may put in their room such of our culinary vegetables as have most analogy with them, from their leaves, their flowers, their roots, and their grains, such as the daucus genus: the artichoke will there usefully replace the gaudy thistle; the domestic plumb-tree ingrafted on a wild stock of the same plant, in the very place where this spontaneously sprung up, will become extremely vigorous. I am persuaded that by these natural approximations, advantage might be derived from the most barren sands and rocks; for there is not a single genus of wild plant but what contains a species fit for food.

But it was not sufficient for Nature to have established so many harmonies between plants, and the situations in which they were destined to vegetate, had she not likewise provided means for restoring them, when destroyed by the intolerant culture of Man. Let a piece of ground be left uncultivated for ever so short a space of time, and you will presently see it clothed with vegetables. They grow in that case in such numbers, and so vigorously, that there is no husbandman capable of producing an equal quantity on the same spot, let him take what pains he will. These shoots however, so vigorous and so rapid, which frequently take possession of our dock-yards of free-stone, of our walls of ashlar, and of our courts paved with granite, are in many cases only a provisional culture. Nature who is always advancing from harmony to harmony, till she has attained that point of perfection which she has proposed to herself, sows at first with grasses, and with herbage of dif-

ferent species, all abandoned soils, waiting for an opportunity of exerting her powers, to raise on that very spot vegetables of a higher order. On the rude neglected districts, where barren downs alone meet our eyes, posterity may behold stately forests arising.

We shall throw, as our custom is, a superficial glance on the very ingenious methods which Nature employs for preparing and conducting those vegetable progressions. We shall hence attain a glimpse at least, not only of the elementary relations of plants, but of those which exist between their different classes, and which extend even to the animal kingdom. Vegetables the most contemptible in the eyes of Man are frequently the most necessary in the order of Creation.

The principal means employed by Nature for securing the growth of plants of every other species, are the thorny plants. It is very remarkable that plants of this description are the first which appear on lands in fallow, or in forests which have been cut down. They are in truth wonderfully well adapted to promote foreign vegetations, because their leaves with deep incisions, like those of the thistle and echium, or their sprigs bent into an arch, as those of the bramble, or their horizontal and interlaced branches, like those of the black-thorn, or their boughs bristled with briars and unprovided with leaves, as those of the sea-rush, leave underneath and around them many intervals through which other vegetables may arise, and find protection from the tooth of most quadrupeds. Nurseries of trees are frequently found in their bosom. Nothing is more

common

common in coppice-woods than to see a young oak start out of a tuft of brambles, which enamels the earth all around with it's clusters of prickly flowers; or a young pine arise out of a yellow brake of marine-rushes.

When these trees have once acquired a certain degree of growth and size, they stifle by their shade those thorny plants, which subsist no longer except along the skirts of the wood, where they enjoy air sufficient for their vegetation. But in this situation, such plants are still going on to extend the empire of their superiors from year to year over the plains. Thus, the thorny plants are the original cradles of the forests; and the scourge of the agriculture of Man is the bulwark of that of Nature.

Man has however imitated in this respect the processes of Nature; for if he wishes to protect the newly sown seeds of his garden, he finds it frequently necessary to cover them with prickly branches of one sort or another. It appears to me probable that there is not a heath but what in time might become a forest, were their commoners restrained from driving the flocks thither to pasture, for the cattle crop the tender shoots of the trees as fast as they spring up. This in my opinion is the reason why the declivities of the lofty mountains of Spain, of Persia, and of many other parts of the World, are not clothed with trees: it is because of the numerous flocks of sheep which are driven thither in Summer, and which roam over their different chains. I am fully convinced that those mountains were covered in the earlier ages

of the World with forests which were laid low by their first inhabitants: and that they would resume their ancient clothing, though now naked and desert, were the cattle to pasture on them no longer. It is very remarkable that those elevated regions are sowed over with prickly plants, just as our heaths generally are.

Don *Garcias de Figueroa*, Ambassador from Spain at the Court of *Cha-Abas* King of Persia, relates, in the account which he has given of his journey, that the lofty mountains of Persia which he crossed, and where the Turcomans are continually straying as they tend their fleecy charge, were covered with a species of thorny shrub, which grew luxuriantly in the most parched situations. This same shrubbery served as a retreat to a great number of partridges.

From this circumstance we take occasion to observe, that Nature employs the birds particularly to sow the thorny plants in places the steepest and most inaccessible. They are accustomed to retire thither in the night, and there deposit with their dung the stony seeds of the bramble-berry, of the berry of the eglantine, of the barberry, and of most thorny shrubs, which, from relations no less wonderful, are indigestible in their stomach.

Birds have besides particular harmonies with those vegetables, as we shall make appear in it's proper place. Not only do they find on them a plentiful supply of food, and shelter under them, but downs for lining their nests, as on thistles, and on the cotton-tree of America; so that if many of them resort

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for safety to the elevation of towering trees, others find it in the thorny brake. There is not a single bush but what has it's peculiar bird.

Independently of the plants proper to each situation, and which are there domesticated, there are some in a state of incessant peregrination, and flit round the earth without settling in any fixed abode. We can easily have a conception of the cause of this constant removal by supposing, what is actually the truth, that several of such plants shed their seeds only at the season when certain regular winds blow, or at certain revolutions of the currents of the Ocean. Whatever may be in this, I am of opinion that we must rank under this description many plants which were known to the Ancients, but which are not now to be found. Such, among others, is the celebrated *lazerpitium* of the Romans, the juice of which, called *lazer*, sold for it's weight in silver. This plant, according to *Pliny*, grew in the vicinity of the city of Corenum, in Africa; but it had become such a rarity in his time as hardly any where to be seen. He tells us that a single plant of it had been found under the reign of *Nero*, and that it was sent to this Prince as a great curiosity.

Modern Botanists pretend that the lazerpitium is the same plant with the *silphium* of our gardens. But they are evidently in an error, from the descriptions which the Ancients, and among others *Pliny* and *Dioscorides*, have left us of it. For my own part, I have no doubt that the lazerpitium is of the number of the vegetables which are destined to flit along the Earth, from East to West, and from West to East.

It is perhaps at present on the western shores of Africa, whither the easterly winds may have conveyed it's seeds; perhaps likewise, by the revolutions of the westerly winds, it may have returned to the place where it was in the days of *Augustus*; or it may have been conveyed into the plains of Ethiopia, among Nations totally unacquainted with its pretended wonderful qualities.

Pliny enumerates a great many other vegetables, which are at this day to us equally unknown. It may merit observation, that those vegetable apparitions have been contemporary with several species of flitting birds, which have likewise disappeared. It is well known that there are several classes of birds, and of fishes, which do nothing but migrate incessantly over the Earth and through the Seas; some in a certain revolution of days; others at the end of a certain period of years. Many plants may be subjected to a similar destiny. This law extends even to the Heavens, in which some new star is from time to time making it's appearance. Nature, as I think, has disposed her Works in such a manner as to have always some novelty in reserve, in order to keep man continually in exercise. She has established, in the duration of the existence of the different beings of each kingdom, concerts of a moment, of an hour, of a day, of a moon, of a year, of the life of a man, of the duration of a cedar, and perhaps of that of a globe: but this undoubtedly is known to the SUPREME BEING alone.

I am persuaded at the same time, that the greatest part of flitting plants must have a principal centre, such

such as a steep rock, or an island in the midst of the Sea, from whence they diffuse themselves over all the rest of the world. This leads me to deduce what I consider as an irrefragable argument in support of the recent Creation of our Globe; it is this, were the Globe of very remote antiquity, all the possible combinations of the propagation of plants by seed would have been already completed all over the World. Thus, for example, there would not be an uninhabited island and shore of the Seas of India which you would not find planted with cocoa-trees, and sown with cocoa-nuts, which the Ocean wafts thither every year, and which it scatters alternately on their strands, by means of the variety of it's monsoons and of it's currents. Now it is unquestionably certain, that the radiations of that tree and it's fruit, the principal focuses of which are in the Maldivia Islands, are not hitherto diffused over all the islands of the Indian Ocean.

The Philosopher *Francis Leguat*, and his unfortunate companions, who were, in the year 1690, the first inhabitants of the small Island of Rodriguez, which lies a hundred leagues to the eastward of the Isle of France, found no cocoa-trees in it. But precisely at the period of their short residence there, the Sea threw upon the coast several cocoa-nuts in a state of germination; as if it had been the intention of Providence to induce them, by this useful and seasonable present, to remain on that island and to cultivate it.

Francis Leguat, who was unacquainted with the relation which seeds have to the element in which

they are designed to grow, was very much astonished to find that those fruits, which weighed from five to six pounds, must have performed a voyage of sixty or fourscore leagues without being corrupted. He took it for granted, and he was in the right, that they came from the Island of St. Brande, which is situated to the North-east of Rodriguez. These two desert islands had not as yet, from the Creation of the World, communicated to each other all their vegetables, though situated in a current of the Ocean which sets in alternately, in the course of one year, for six months toward the one, and six months toward the other.

However this may be, they planted those cocoa-nuts, which in the space of a year and a half sent out shoots of four feet in height. A blessing from Heaven so distinctly marked, had not the power of detaining them in that happy island. An inconsiderate desire of procuring for themselves women constrained them to abandon it, notwithstanding the remonstrances of *Leguat*, and plunged them into a long series of calamities which few of them were able to survive. For my own part, I can entertain no doubt that had they reposed the confidence in Providence which they had reason to do, it's care would have conveyed wives for them into that desert Island, as it had sent to them the gift of the cocoa-nut.

To return to the subject of vegetable navigation; all the combinations and the versatilities of their sowings, would have been long ago completed in islands lying between the same parallels, and in the same monsoons, if the World had been eternal. The double cocoa-nuts, the nurseries of which are in the Sechelles

Sechelles Islands, would have diffused themselves, and would have had time to germinate on the Malabar coast, on which the Sea is from time to time throwing them. The Indians would have planted upon their shores those fruits to which they ascribed virtues so miraculous, while the palm-tree which bears them was so entirely unknown but twelve years ago to the people of this coast, that they believed them to be natives of the bottom of the Sea, and thence gave them the appellation of marine cocoa-nuts. There are in like manner a multitude of other fruits between the Tropics, of which the primordial stocks are in the Moluccas, in the Phillippines, in the islands of the South-Sea, and which are entirely unknown on the coasts of both Continents, and even in the adjacent islands, which undoubtedly would have become there the objects of cultivation to their inhabitants had the Sea been allowed sufficient time to multiply the projection of them on their shores.

I shall pursue this reflection no farther; but it evidently demonstrates the newness of the World. Were it eternal, and exempted from the care of a Providence, it's vegetables would long since have undergone all the possible combinations of the chance which re-sows them. We should find their different species in every situation where it was possible for them to grow. From this observation I deduce another consequence, namely this, That the AUTHOR of Nature evidently intended to link Mankind together by a reciprocal communication of benefits, the chain of which is as yet very far from being completed. Where is, for example, the benefactor of

Humanity

Humanity, who shall transport to the Ostiacs and the Samoïèdes of Waigat's Strait, Winter's tree from the Straits of Magellan, the bark of which unites the savour of cloves, of pepper, and of cinnamon? And who is the man that shall convey to Magellan's Strait the pease-tree of Siberia, to feed the starving Patagonian?

What a rich collection might Russia make, not only of the trees which thrive in the northern and the southern regions of America, but of those which, in all parts of the World, crown the lofty ice-covered mountains, whose elevated ridges have a temperature approaching to that of her plains? Wherefore beholds she not her forests enriched with the pines of Virginia, and with the cedars of Mount Lebanon? The desert shores of the Irtis might every year clothe themselves with the same species of oats wherewith so many Nations, inhabiting the banks of the rivers of Canada, are principally supported. Not only might she collect in her plains the trees and the plants of cold Latitudes, but a great number of annual vegetables which grow during the course of a Summer in warm and temperate Latitudes. I know by experience that the Summer's heat is as powerful at Petersburg as under the Line.

There are besides parts of the ground in the North, which have configurations perfectly adapted to afford a shelter against the northerly winds, and to multiply the warmth of the Sun. If the South has it's icy mountains, the North has it's reverberatory valleys. I have seen one of those small valleys near Petersburg, at the bottom of which flows a brook that never freezes

freezes even in the midst of Winter. The rocks of granite wherewith Finland is roughened all over, and which according to the report of Travellers cover most of the lands of Sweden, of the shores of the Frozen Ocean, and all Spitzbergen, are sufficient for producing the same temperatures in many places, and for diminishing in them to a considerable degree the severity of the cold.

I have seen in Finland, near Wiburg, beyond the sixty-first degree of Latitude, cherry-trees entirely exposed to the weather, though these trees are natives of the forty-second degree; that is of the kingdom of Pontus, from whence *Lucullus* transplanted them to Rome after the defeat of *Mithridates*. The peasantry of that Province cultivate tobacco with success, which is a much more southerly plant, being originally a native of Brasil. It is I admit an annual plant, and that it does not acquire in it's northern situation a very high degree of perfume; for they are under the necessity of exposing it to the heat of their stoves, in order to bring it to a state of perfect maturity. But the rocks with which Finland is covered over would undoubtedly present, to attentive eyes, reverberating situations which might bring it to a sufficient degree of maturity, without the aid of artificial heat.

I myself found, not far from the city of Fredricksham, upon a dunghill under the shelter of a rock, a very lofty tuft of oats the produce of a single seed, consisting of thirty-seven stalks, loaded with as many ears completely ripe, without reckoning a multitude of other small suckers. I gathered it with an intention

tion of having it presented to her Imperial Majesty, *Catherine* II. by my General M. *Dubosquet*, under whose orders, and in whose company I was then visiting the fortified places of that province: it was likewise his intention; but our Russian attendants, careless as all slaves are, suffered it to be lost. He was exceedingly vexed at this as well as I. It is impossible to help thinking, that a sheaf of corn so rich and beautiful, the produce of a province considered even at Petersburg as smitten with sterility, because of the rocks which cover it's surface, and which procured for it from ancient Geographers the epithet of *lapidosa* (stony), would have been as acceptable to her Majesty, as the huge block of granite which she has since had conveyed from thence, to be formed at Petersburg into the basis of a statue of *Peter* the Great.

I have seen in Poland several private individuals cultivate the vine and the apricot-tree with very great success. M. *de la Roche*, Consul from the Prince of Moldavia, carried me when at Warsaw to a little garden in the suburbs of that city, which produced to the occupier an annual revenue of one hundred pistoles, though it did not contain quite thirty of the last-mentioned tree. It was totally unknown in that country a hundred and fifty years ago. The apricot was first introduced into it by a Frenchman, valet-de-chambre to a Queen of Poland. This man raised the fruit secretly, and made presents of it to the Grandees of the Country, pretending that he had received it from France by the couriers of the Court. The great did not fail to pay him magnificently for his

his presents; and this species of commerce became to him the foundation of an ample fortune, by means of which his great grand-children are at this day the most opulent Bankers of that Country.

What I have said respecting the possibility of enriching Russia and Poland with useful vegetables, is not only in the view of acknowledging, the best way in my power, the gracious reception with which I was honoured by persons of rank, and by the Government of those Countries, when I was a stranger among them; but because these indications tend equally to the improvement of France, the Climate of which is more temperate. We have icy mountains capable of producing all the vegetables of the North; and reverberating valleys equally adapted to the production of most of those of the South. It would not be proper, as our custom is, to make an effort to render this species of culture general through a whole district, but to set it a-going in some little sheltered exposure, or in some small winding valley. The influence of these positions is of no great extent. Thus the famous Constantia vine of the Cape of Good-Hope succeeds perfectly only on a small spot of ground, situated at the bottom of a little hill, whereas the adjoining and surrounding vineyards do not produce the muscadine grape of any thing like the same quality. Of this too I have had personal experience.

In France it would be proper to look for sheltered aspects, such as we have been describing, in places where there are white stones in abundance, the colour of which is the best adapted to reverberate the

rays

rays of the Sun. Nay I believe that marl is indebted to it's white colour for part of the heat which it communicates to the lands on which it is spread; for it reflects upon them the rays of the Sun with so much activity, as to burn up the first shoots of many herbs. This is the reason, if I am not mistaken, why marl, which has in other respects the principles of fecundation within itself, kills a great many of the smaller herbs which are accustomed to grow under the shade of the corn, and whose first leaves are more tender than those of corn, which is in general the most hardy of gramineous plants.

It would be farther necessary to look for those fortunate exposures in the vicinity of the Sea, and under the influence of it's winds, which are so necessary to the vegetation of many plants that several of them refuse to grow in the inland parts of a country. Such is among others the olive-tree, which it has been found impossible to propagate in the interior of Asia and of America, though the Latitude be in other respects favorable. Nay I have remarked that it is not fruitful in islands and on shores where it is excluded from the sea-breezes. To this cause I ascribe the sterility of those which have been planted in the Isle of France, on it's western shore; for it is sheltered from the East-winds by a chain of mountains. As to the cocoa-tree, it will not thrive between the Tropics, unless it has, if I may venture to say so, it's root in the sea-water. It is I firmly believe for want of those geographical considerations, and some others of a similar nature, that many plans of improvement in cultivation have failed in France, and in her Colonies.

However

However that may be, it might be possible to find within the kingdom an icy mountain, with perhaps a reverberating valley below. It would be a most agreeable employment to go in search of such a situation, and the greatest benefits might be derived from it. We might convert it into a Royal Garden, which would present to our Sovereign a spectacle of the vegetation of a multitude of climates, upon one line of less than fifteen hundred fathoms of elevation. There he might bid defiance to the burning heat of the dog-star, under the shade of cedars, on the mossy bank of a rivulet issuing from the snow; and perhaps escape the severity of Winter's cold, at the bottom of a valley with a southern aspect, under the palm-tree, and amidst a field of sugar-canes. We might there naturalize the animals which are the compatriots of those vegetables. He might hear the braying of the rein-deer of Lapland, from the same valley in which he would see the peacocks of Java building their nests. This landscape would collect around him a part of the tributes of the Creation, and exhibit to him an image of the terrestrial paradise, which was situated as I suppose in a similar position. In serious truth, I cannot help expressing a wish that our Kings would extend their sublime enjoyments, as far as the study of Nature has pursued it's researches under their flourishing Empire.*

It

* *Nescia mens hominum fati fortisque futuræ!* Ah, blind to futurity! Little did good *Saint-Pierre* think that the ill-fated Prince, for whom he took so much delight to plant and decorate this earthly Paradise, was in the course of a few fleeting years to be dethroned, imprisoned, condemned, and publicly executed, in the

It now remains that I examine the harmonies which plants form with each other. These harmonies constitute the inexpressible charm lavished on the sites which Nature has sowed and planted with her own hand; and they are to be the subject of the ensuing section.

VEGETABLE HARMONIES OF PLANTS.

We are going to apply to plants the general principles laid down in the preceding Study, by examining one after another the harmonies of their colours and of their forms.

The verdure of plants, which is so graceful to the eye, is a harmony of two colours opposite in their elementary generation of yellow which is the colour of the Earth, and of blue which is the colour of the Heavens. Had Nature dyed plants yellow, they would have been confounded with the ground; if blue, they would have been confounded with the Heavens and the Waters. In the first case, all would have appeared Earth; in the second, all would have appeared sea: but their verdure gives them contrasts the most delightful with the grounds of this magnificent picture, and consonances equally agreeable with the yellow colour of the Earth, and with the azure of the Heavens.

The green colour possesses this farther advantage, that it accords in a most wonderful manner with all

the Metropolis of his own Kingdom; and the very name of King proscribed by a Nation once enthusiastically attached to Royalty. How wonderful are the Works of Nature! How mysterious the Ways of Providence!—H. H.

the

the others, which arises from it's being the harmony of the two extreme colours. Painters who are endowed with taste, hang the walls of their exhibition-rooms with green, in order that the pictures, of whatever colours, may detach themselves from that ground without harshness, and harmonize upon it without confusion.*

Nature, not satisfied with this first general tint, has employed, in extending it over the ground of her scene, what Painters call *transitions*. She has appropriated a particular shade of bluish green, which we call sea-green, to plants which grow in the vicinity of water, and of the Heavens. This is the shade which in general tinges the plants of the shores, as reeds, willows, poplars; and those of high grounds, as the thistle, the cypress, and the pine; and which makes the azure of the rivers to harmonize with the verdure of the meadows, and the azure of the Heavens with the verdure of the heights. Thus, by means of this light and fugitive tint, Nature diffuses delicious harmonies over the limits of the waters, and along the profiles of landscapes; and it is productive of a still farther magic to the eye, in that it gives greater apparent depth to the valleys, and more elevation to the mountains.

* Undoubtedly when they put on a green ground pictures of plants or landscapes, such pictures detach themselves from it but indifferently. There is, in my opinion, a tint better adapted to be the ground of a picture-gallery; namely, gray. This tint, formed of black and white, which are the extremes of the chain of colours, harmonizes with every other without exception. Nature frequently employs it in the Heavens, and on the Horizon, by means of vapours and of clouds, which are generally of that colour.

Something more wonderful still challenges our attention, namely this, that though she employs but one single colour in arraying so many plants, she extracts out of it a quantity of tints so endlessly varied, that each of those plants has it's own, peculiar to itself, and which detaches it sufficiently from it's neighbour to be distinguishable from it; and each of these tints is farther varying from day to day, from the commencement of Spring, when most of them exhibit themselves in a bloody verdure, up to the last days of Autumn, when they are transformed into various yellows.

Nature, after having thus harmonized the ground of her picture by means of a general colour, has detached from it every vegetable in particular by means of contrasts. Such as are designed to grow immediately on the ground, on strands, or on dusky rocks, are entirely green, both leaves and stems, as the greatest part of reeds, of grasses, of mosses, of tapers, and of aloes; but those which are destined to arise out of the midst of herbage, have stems of different tints of brown; such are the trunks of most trees, and the stalks of shrubs. The alder, for example, which thrives amidst the grassy turf, has a stem of an ash-coloured gray; but the wallwort, which entirely resembles it in all other respects, and which grows immediately on the ground, is green all over. The mugwort, which grows along hedges, has reddish stems, by which it is easily distinguishable from the neighbouring shrubs. Nay there are in every genus of plants, certain species which, by their shining colours, seem to have been formed for terminating the limits

limits of their classes. Such is, in the sorb genus, a species called the Canadian service tree, the branches of which are of a coral red. There are in the willow tribe, osiers whose scions are as yellow as gold ; but there is not a single plant which does not detach itself entirely from the ground which surrounds it by it's flowers and by it's fruits.

It is impossible to suppose that so many varieties should be mechanical results of the colour next to which bodies are placed ; for example, that the bluish green of most mountain-vegetables should be an effect of the azure of the Heavens. It is worthy of being remarked, that the blue colour is not to be found, at least as far as I know, in the flowers or in the fruits of lofty trees ; for in this case they would be confounded with the Heavens ; but it is very common on the ground in the flowers of herbs, such as the blue-bottle, the scabious, the violet, the liverwort, the iris, and many others. On the contrary, the colour of the earth is very common in the fruits of lofty trees, such as the chestnut, the walnut, the cocoa-nut, and the cone of the pine. Hence we have an intimation that the point of view of this magnificent picture was taken from the eye of Man.

Nature, after having distinguished the harmonic colour of each vegetable by the contrasting colour of it's flowers and of it's fruits, has followed the same laws in the forms which she has given them. The most beautiful of forms, as we have seen, is the spherical ; and the most agreeable contrast which it is capable of presenting, is when found in opposition to the radiating form. You will frequently find this

form and it's contrast in the aggregation of the flowers that go by the name of radiated, as the daisy, which has a circle of small white divergent petals surrounding it's yellow disk: we find it likewise, with other combinations, in the blue-bottle, in the asters, and in a multitude of other species. When the radiating parts of the flower are outermost, the spherical are inmost, as in the species which I have just named; but when the first are inmost, the spherical parts are outermost; this may be remarked in those whose stamina are drawn out into length, and the petals in spherical portions, such as the flowers of the hawthorn and of the apple-tree, and most part of the rosaceous and liliaceous plants. Sometimes the contrast of the flower is with the surrounding parts of the plant. The rose is one of those in which it is most strongly marked: it's disk is formed of beautiful spherical portions, it's calix is bristled with beards, and it's stalk beset with thorns.

When the spherical form is found placed in a flower between the radiating and the parabolic, then there is a complete elementary generation, the effect of which is always highly agreeable; it is this too which is produced by most of the flowers that have just been named, by the profile of their calices, which terminate their projecting stems. The nosegay girls are so sensible of the value of this combination, that they sell a simple rose on it's branch at a much higher price than they would ask for a large posy of the same flowers, especially if there are on it a few buds, which present the charming progressions of the florification. But Nature is so vast, and my incapacity so great, that

that I must restrict myself to throwing a simple glance on the contrast which arises from the simple oppositions of forms: it is so universal that Nature has given it to plants which had it not in themselves, by opposing them to others which have a configuration entirely different.

The species opposite in forms are almost always in company. When you fall in with an old willow on the bank of a river which art has not degraded, you may frequently see upon it a great convolvulus covering the radiated foliage of the tree with it's own heart-formed leaves, and it's bell-shaped white flowers to make up the defect of apparent flowers, which Nature has denied to this tree. Different species of ropeweed produce the same harmonies on various species of tall gramineous plants.

These plants, called creeping, are scattered over the whole vegetable kingdom, and are appropriated as I suppose to each vertical species. They have a great variety of methods of fixing themselves on the upright plant, which would alone merit a particular treatise. There are some which turn themselves spirally around the trunks of forest trees, such as the honey-suckle; others, as pease, have hands with three to five fingers, by which they lay hold of shrubbery: it is very remarkable that those hands do not make their appearance till they have acquired a height at which they begin to have occasion for them as a support; others, as the bastard-pomegranate, attach themselves in form of a cork-screw; others form a simple hook with the tail of their leaf, as the nasturtium: the pink employs a similar method of adhe-

sion. These two beautiful flowers are supported in our garden with rods; but it would be a problem well worthy of the investigation of Florists, to ascertain what are the auxiliary plants, if I may call them so, to which these were designed to unite themselves in the places where they are native; delightful groups might be formed by their re-union.

I am persuaded that there is not a vegetable but what has it's opposite in some part of the Earth: their mutual harmony is the cause of the secret pleasure which we feel in wild rural scenes, where Nature is at liberty to combine them. The fir tree rises in the forest of the North like a lofty pyramid, of a dark green, and with a motionless attitude. The birch is almost always found in it's vicinity, and grows to nearly the same height, is of the form of an inverted pyramid, of a lively verdure, with a moveable foliage, continually playing about with every breath of the wind. The round-leafed trefoil loves to grow in the midst of the fine grass, and to adorn it with it's own flowery nosegay. Nay I believe that Nature has made those deep incisions in the leaves of a great many vegetables, entirely in the view of facilitating alliances of this sort, and of opening a passage for the grasses, the verdure and delicacy of whose stems form with them an infinity of contrasts. Of this instances innumerable may be seen in uncultivated fields, where tufts of grass pierce through the broad plants of the thistle and the echium. This arrangement has likewise been made, in order that the grasses, which are the most useful of all vegetables, might receive a portion of the rain from Heaven, through the interstices

stices of the broad foliage of those privileged children of Nature, which would stifle every thing around them, were it not for those profound incisions. Nature does nothing merely for the pleasure of doing it, but always connects with it some reason of utility: this appears to me so much the more decidedly marked, that the incisions in leaves are much more common and deeper in the plants and under-shrubbery which rise to no great height, than in trees.

The harmonies resulting from contrast are to be found even in the waters. The reed, on the brink of rivers, raises into the air it's radiating leaves and it's embrowned distaff, whereas the nymphæa extends at it's feet a broad heart-formed foliage, and roses of yellow gold: the one presents on the waters a continued pallisade, and the other a platform of verdure.

Similar oppositions present themselves in the most frightful of climates. *Martens* of Hamburg, who has given a very good account of Spitzbergen, tells us, that when the seamen belonging to the vessel in which he navigated along it's coasts, heaved up the anchor, they seldom failed to bring up with it a very broad leaf of the *alga marina*, six feet in length, and attached to a tail as long: this leaf was smooth, of a brown colour spotted with black, striped with two white stripes, and made in form of a tongue: he calls it the plant of the rock. But what is very singular, it was usually accompanied by a hairy plant, about six feet in length, like a horse's tail, and formed of hairs so fine, that one might denominate it, says he, the silk of the rock. He found on those dismal shores, where the empire of *Flora* is in such a state of deso-

lation, the *cochlearia* (scurvy-grass) and the sorrel, which grew together. The leaf of the first is rounded in form of a spoon, that of the other is lengthened into the shape of the iron head of an arrow. A Physician of considerable ability, of the name of *Bartholin*,* has observed, that the virtues of their salts are as opposite as their configurations; those of the first are alkalies, those of the other are acids; and from their union results what medical men call a neutral salt, which they ought rather to call a harmonic salt, the most powerful remedy which can be employed as an antiscorbutic, and the scurvy is a disease which is readily and usually caught in those dreadful climates.

For my own part, I apprehend that the qualities of plants are harmonic as their forms; and that as often as we find them grouped agreeably and constantly, there must result from the union of their qualities, for nourishment, for health, or for pleasure, a harmony as agreeable as that which arises from the contrast of their figures. This is a presumption that I could support, by referring to the instinct of animals, which in browsing on the herbage vary the choice of their aliments; but this consideration would lead me away from my subject.

I should never come to a conclusion, were I to go into a detail respecting the harmonies of so many plants which we undervalue, because they are feeble or common. If we suppose them, for thought's sake, of the size of our trees, the majesty of the palm would disappear before the magnificence of their attitudes and of their proportions. Some of them,

* See *Chomel's* History of Common Plants.

such

such as the echium, rise like superb chandeliers, forming a vacuum round the centre, and rearing toward Heaven their prickly arms, loaded their whole length through with lamps of violet-coloured flowers. The verbascum, on the contrary, extends around it broad leaves of solemn drapery, and sends up from it's centre a long distaff of yellow flowers, as salutary to the stomach as grateful to the touch. The violet of deep blue contrasts in the Spring with the primrose, expanding it's golden cup with a scarlet brim. On the embrowned angles of the rock, under the shade of ancient beech-trees, the mushroom, white and round as an ivory piece for the chess-board, arises out of a bed of moss of the most beautiful green.

Mushrooms alone present a multitude of unknown consonances and contrasts. This class is, first, the most varied of all those of the vegetables of our climates. *Sebastian lè Vaillant* enumerates one hundred and four species of them in the vicinity of Paris, without taking into the account the fungoïds, which furnish at least a dozen more. Nature has dispersed them over most shady places, where they frequently form contrasts the most extraordinary. There are some which thrive only on the naked rock, where they present a forest of small filaments, each of which supports it's particular chapiter. There are some which grow on substances the most abject, with forms the most solemn; such is that which thrives on what falls from the horse, and which resembles a Roman hat, whence it has borrowed it's name. Others present agreeable consonances: such is that which grows at the foot of the alder, under the form of a cockle.

What

What nymph has planted a shell by the root of a tree of the rivers?

This numerous tribe appears to have it's destiny attached to that of the tree, which have each a mushroom appropriated to itself, and rarely to be found elsewhere: such are those which grow only on the roots of plumb-trees and pines. To no purpose does Heaven pour down it's copious rains; the mushroom under covert of it's umbrella, receives not a single drop. They derive the whole support of life from the Earth, and from the potent vegetable to whose fortune they have united their own: like those little Savoyards who are planted as posts at the gates of the hotels of the Great, they extract their subsistence out of the superfluity of another; they grow under the shade of the Powers of the forest, and live on the superabundance of their sumptuous banquets.

Other vegetables present oppositions of strength to weakness in a different way, and consonances of protection still more distinguished. Those which we have been mentioning, like lordly Chieftains leave their humble friends at their feet: the others carry them in their arms, and place them upon their heads. They frequently receive the recompence of their noble hospitality. The liannes which in the Antilles-Islands attach themselves to the trees of the forest, defend them from the fury of the hurricane. The Gallic Oak has oftener than once seen itself an object of veneration to the Nations, from having carried the mistletoe in it's branches. The ivy, a friend to monuments and tombs; the ivy, with which in ancient times they crowned the Poets who conferred immortality,

sometimes

sometimes covers with it's foliage the trunks of the stateliest trees. It is one among many of the irresistible proofs of the vegetable compensations of Nature; for I do not recollect that I ever saw the ivy on the trunks of pines or firs, or of other trees whose foliage lasts all the year round. It invests those only which are stripped by the hand of Winter. Symbol of a generous friendship, it attaches itself only to the wretched; and when death itself has smitten it's protector, it restores to him again the honours of the forest where he lives no longer; it makes him revive by decorating his shade with garlands of flowers, and festoons of undecaying verdure.

The greatest part of plants which grow under the shade are adorned with the most vivid colours; thus the mosses display the brilliancy of their emerald green on the dusky sides of the rocks. In the forests, the mushroom and the agricum distinguish themselves by their colours from the roots of the trees under which they grow. The ivy detaches itself from their gray barks by it's shining green; the mistletoe discloses it's branches of a yellowish green, and it's fruits similar to pearls, amidst the thick foliage of the oak. The aquatic convolvulus dazzles you with it's large white bell-shaped flowers on the trunk of the willow. The virgin's-bower clothes with verdure the ancient towers, and in Autumn her foliage of gold and purple seems to fix on their sober eminences the rich colours of the setting Sun. Other plants, entirely concealed from the eye, discover themselves by their perfumes. It is thus that the obscure violet invites the hand of lovers to the bosom of the prickly shrub.

shrub. And thus is verified on every hand, that great Law of contrasts which governs the World; No aggregation is in plants the effect of chance.

Nature has established in the numerous tribes of the vegetable kingdom a multitude of alliances, the end of which is unknown to us. There are plants, for example, the sexes of which are on different individuals, as in the animal Creation. There are others whom you always find united in several clusters, as if they loved to live in society; others, on the contrary, you almost always meet with in a state of solitude. I presume that many of these relations are connected with the character of the birds which live on their fruits, and which re-sow them. The herbage in the meadows frequently represents the bearing of the trees in the forests; there are some which in their foliage and proportions resemble the pine, the fir, and the oak: nay I believe that every tree has a consonance in it's corresponding herb. It is by a magic of this sort that small spots of ground present to us the extent of a large district. If you are under a grove of oaks, and perceive on an adjoining hillock tufts of germander, the foliage of which resembles them in miniature, you feel all the effect of a perspective. These diminutions of proportion extend from trees even down to mosses, and are the causes in part of the pleasure which we enjoy in wild rural scenes, where Nature has had leisure to dispose and accomplish her plans. The effect of those vegetable illusions is so undoubtedly certain, that if you have the ground cleared, the extent of any particular spot, when stripped

ped of it's natural vegetables, appears much smaller than before.

Nature farther employs diminishing shades of verdure, which being lighter on the summit of trees than at their base, gives them the appearance of being more lofty than they really are. She appropriates, besides, the pyramidical form to many mountain-trees, in order to increase the apparent elevation of their site; this is observable in the larch, the fir, the cypress, and in many other plants which grow on heights. She sometimes unites in the same place, the effects of seasons and of climates the most opposite. She clothes in hot climates the whole sides of mountains with the vegetable called the ice-plant, because it seems entirely covered over with flakes of ice; you would believe that in the midst of Summer, *Boreas* had breathed upon it all the chilling blasts of the North.

On the other hand we find in Russia, mosses in the midst of Winter; which, from the red and smoky colour of their flowers, have the appearance of being set on fire. In our rainy climates she crowns the summits of hillocks with broom and rosemary; and the tops of ancient towers with the yellow gilly-flower: in the midst of the gloomiest day you would imagine you saw the rays of the Sun shining upon them.

In another place she produces the effect of the wind in the midst of perfect stillness. In many parts of America, a bird has only to alight on a tuft of the sensitive plant, in order to put in motion the whole

stripe,

stripe, which sometimes extends to three furlongs. The European traveller stands still, and observes with astonishment the air tranquil, but the herbage in motion. I myself have sometimes mistaken, in our own woods, the murmur of poplars and of aspins for the bubbling of the brooks. Oftener than once seated under their shade on the skirt of a meadow, whose herbage the winds put into an undulatory motion, this multiplied tremulousness has transfused into my blood the imaginary coolness of the stream.

Nature frequently employs the aërial vapours in order to give a greater extent to our landscapes. She diffuses them over the cavities of valleys, and stops them at the windings of rivers, giving you a glimpse, at intervals, of their long canals illumined by the Sun. She thus multiplies their plans, and prolongs their extent. She sometimes withdraws this magic veil from the bottom of the valleys; and rolling it over the adjacent mountains, on which she tinges it with vermilion and azure, she confounds the circumference of the Earth with the vault of Heaven. It is thus that she employs clouds as evanescent as the illusions of human life, to raise us to Heaven. It is thus that she expands over her most profound mysteries, the ineffable sensations of infinity, and that she withdraws from our senses the perception of her Works, in order to convey to our minds a more impressive feeling of them.

ANIMAL HARMONIES OF PLANTS.

Nature, after having established on a soil formed of fragments insensible and lifeless, vegetables endowed with

with principles of life, of growth, and of generation, accommodated to those beings which had, together with these same faculties, the power of self-motion, dispositions to inhabit them, passions to derive their nourishment from them, and an instinct which impels them to make a proper choice: these are animals. I shall here speak only of the most common relations which they have with plants; but were I to attempt a detail of those which their innumerable tribes have with the elements, with each other, and with Man, whatever might be my ignorance, I should disclose a multitude of scenes still more worthy of admiration.

In an order entirely new, Nature has not changed her Laws: she has established the same harmonies and the same contrasts, of animals to plants, as of plants to the elements. It would appear natural to our feeble reason, and consonant to the great principles of our Sciences, which ascribe so much power to analogies, and to physical causes, that so many sensible beings which are produced in the midst of verdure, should be in process of time affected by it. The impressions of their parents, added to those of their own infancy, which serve to explain so many appearances in the human species, acquiring in them increasing strength from generation to generation, by new tints, ought at length to exhibit oxen and sheep as green as the grass on which they pasture. We have observed in the preceding Study, that as vegetables were detached from the ground by means of their green colour, the animals which live on verdure distinguish themselves from it in their turn, by means of their dusky colours; and those which live on the

dusky

dusky barks of trees, or on other dark grounds, are invested with colours brilliant, and sometimes green.

On this subject I have to remark, that many species of the birds of India which live amidst the foliage of trees, as the greatest part of paroquets, many of the colibri, and even of the turtles, are of the finest green; but independently of the white, blue, and red marbled spots, which distinguish their different tribes, and render them perceptible at a distance upon the trees, the brilliant verdure of their plumage detaches them, to great advantage, from the solemn and imbrowned verdure of those southern forests. We have seen that Nature employs this as the general means of diminishing the reflexes of the heat; but that she might not confound the objects of her picture, if she has darkened the ground of her scene, she has bestowed greater brilliancy on the dresses of the actors.

It would appear that Nature has appropriated the species of animals coloured in the most agreeable manner, to the species of vegetables whose flowers are the least vivid, as a compensation. There are much fewer brilliant flowers between the Tropics than in the Temperate Zones; and as a compensation, the insects, the birds, and even the quadrupeds, such as several species of monkeys and lizards, are there arrayed in the most lively colours. When they rest on their proper vegetable, they form with them the most beautiful contrasts, and the most lovely harmonies. I have often stood still in the West-Indies, to contemplate the little lizards, which live on the branches of trees, employ themselves in catching flies. They are of a beautiful apple-green, and have on their back a sort

a sort of characters of the most vivid red, resembling the letters of the Arabian alphabet. When a cocoa-tree had several of them dispersed along it's stem, never was there Egyptian Pyramid of porphyry with it's hieroglyphics, so mysterious and so magnificent in my eyes.*

I have likewise seen flocks of small birds, denominated *cardinals*, because they are red all over, settle on shrubbery, the verdure of which was blackened by the Sun, and present the appearance of girandoles studded with little burning lamps. Father *du Tertre* says, that there is not, in the Antilles, a spectacle more brilliant, than the alighting of coveys of the parrot species, called *arras*, on the summit of a palm-tree. The blue, the red, and the yellow of their plumage, covers the boughs of the flowerless tree with the most superb enamel. Harmonies somewhat similar may be seen in our own climates. The gold-finch, with his red head and wings tipped with yellow, appears at a distance on a bush, like the flower of the thistle in which he was hatched. You would sometimes take the slate-coloured wagtail, when perched on the extremity of the leaves of a reed, for the flower of the iris.

It would be a very great curiosity to collect a great number of these oppositions, and of those analogies. They would lead us to a discovery of the plant

* They have sometimes served me to explain the moral sense of hieroglyphics, engraven on the obelisks of Egypt in honour of her conquering heroes. On beholding the characters traced upon them from right to left, with heads, beaks, and paws, they brought to my recollection the little fly-catchers of my palm-tree.

which is peculiarly adapted to each animal. Naturalists have paid to those adaptations no great degree of attention; such of them as have written the History of Birds, class them according to the feet, the bill, the nostrils. They sometimes speak of the seasons of their appearance, but scarcely ever of the trees which they frequent. Those only who, employed in making collections of butterflies, are frequently under the necessity of looking for them in their state of nymph, or caterpillar, have sometimes distinguished those insects by the names of the vegetables on which they found them. Such are the caterpillars of the tithymal, of the pine, of the elm, and so on, which they discovered to be peculiarly appropriated to these vegetables. But there is not an animal existing but what may be referred to it's own particular corresponding plant.

We have divided plants into aërial, aquatic, and terrestrial, as animals themselves are divisable, and we have found in the two extreme classes unvarying harmonies with their elements. They may be farther divided into two classes, into trees and herbs, as animals likewise are into volatile and quadrupeds. Nature does not associate the two kingdoms in consonances, but in contrasts; that is, she does not attach the great animals to the great vegetables; but unites them contrariwise, by associating the class of trees with that of the small animals, and that of herbs with the great quadrupeds: and by means of these oppositions she bestows adaptations of protection to the feeble, and of accommodation to the powerful.

This Law is so general, that I have remarked in every

every country, where there is no great variety in the species of grasses, those of the quadrupeds which live upon them are but few in number; and that wherever the species of trees are multiplied, those of volatiles are likewise so. The truth of this may be ascertained by consulting the herbals of many parts of America, and among others those of Guyana and of Brasil, which present but few varieties in the grasses, but a great number in the trees. It is well known that those countries have in fact few quadrupeds natural to them, and that they are peopled, on the contrary, with an infinite variety of birds and insects.

If we cast a glance on the relations of grasses to quadrupeds, we shall find that, notwithstanding their apparent contrasts, there is actually between them a multitude of real correspondences. The moderate elevation of the gramineous plants places them within reach of the jaws of quadrupeds, whose head is in a horizontal position, and frequently inclined toward the ground. Their delicate shoots seem formed to be laid hold of by broad and fleshy lips; their tender stems to be easily snapped by the incisive teeth; their mealy seeds easily bruised by the grinders. Besides, their bushy tufts, elastic without being ligneous, present soft litter to ponderous bodies.

If, on the contrary, we examine the correspondences which exist between trees and birds, we shall find that the branches of trees may be easily clasped by the four-toed feet of most birds, which Nature has disposed in such a manner, that by means of three before and one behind, they may be able to grasp the bough as with a hand. Again, the birds find in the

different tiers of the foliage, a shelter against the rain the Sun, and the cold, toward which the thickness of the trunks farther contribute. The apertures formed in these, and the mosses which grow upon them, furnish situations for building their nests, and materials for lining them. The round or oblong seeds of trees are accommodated to the form of their bills. Such as bear fleshy fruits are resorted to by birds, which have beaks pointed, or crooked like a pick-axe.

In the islands of the regions situated between the Tropics, and along the banks of the great rivers of America, the greatest part of maritime and fluviatic trees, among others, many species of the palm-tree, bear fruits enclosed in very hard shells, whereby they are enabled to float on the face of the waters, which re-sow them at a great distance; but their covering does not secure them from the attack of the birds. The different tribes of paroquets which have made them their habitation, and of which I have reason to believe that there is a species appropriated to each species of palm-tree, easily find means to open their hard cases with hooked bills, which pierce like an awl and hold fast like pincers.

Nature has farther accommodated animals of a third order, which find in the bark, or in the flower of a plant, as many conveniences as the quadruped has in a meadow, or the bird in the whole tree: I mean the insects. Certain Naturalists have divided them into six great tribes, which they have characterized according to custom, but to very little purpose, by Greek names. They class them into *coléoptéres*, or cased insects, as the scarab tribe, such are our

our may-bugs, or chafers: into *hémiptérous*, or half-cased, as the gallinsects, such is the kermès: into *tétrapterous farinaceous*, or four-mealy-winged, as butterflies: into *tétraptérous*, without any addition, or four-naked-winged, as bees: into *diptérous*, or two-winged, as the common fly: and into *aptérous*, or wingless, as the ant. But these six classes admit of a multitude of divisions and of subdivisions, which unite species of insects of forms and instincts the most dissimilar; and separate a great many others of them which have otherwise a very striking analogy among themselves.

Whatever may be in this, the order of animals in question appears to be particularly appropriated to trees. *Pliny* observes that ants are singularly fond of the grains of the cypress. He tell us, that they attack the cones which contain them, on their half-opening as they arrive at maturity, and plunder them to their very last seed; and he considers it as a miracle of Nature, that an insect so diminutive should destroy the seed of one of the largest trees in the World. I believe we never shall be able to establish in the different tribes of insects, a real order, and in the study of them, that pleasure and utility of which it is susceptible, except by referring them to the different parts of vegetables. Thus we might refer to the nectars of the flowers, the butterflies and flies which are furnished with a proboscis for sipping up their juices; to their stamina, those flies which, like the bee, have spoon-mouths scooped out in their thighs, lined with hair, for collecting their powder, and four wings to assist them in carrying off their

booty; to the leaves of plants, the common flies and the gallinsects, which have pointed and hollow prongs for making incisions in them, and for drinking up their fluids; to the grains, the scarab race, as the weevil, which is designed to force it's way into the heart of the seed to feed upon it's meal, and which is provided with wings inclosed in cases, to prevent their being injured, and with a file to open for itself a passage to the stem, those worms which are quite naked because they have no need of being clothed in a substance of wood to shelter them on every side, but they are furnished with augers, by the help of which they sometimes go nigh to destroy whole forests: finally, to the wreck of every sort, the ants which come armed with pincers, and with an instinct of advancing in hosts, to cut to pieces and to carry off every thing that suits their purpose.

The desert of this vast vegetable banquet is hurled down by the rainy torrents to the rivers, and thence to the Sea, where it presents a new order of relation with the fishes. It is worthy of remark, that the most attractive baits which can be presented to them are deduced from the vegetable kingdom, and particularly from the grains, or from the substances of plants having the aquatic characters which we have indicated, such as the hard shell of the Levant, the rush of Smyrna, the juice of the tithymal, the Celtic spikenard, the cummin, the annise, the nettle, the sweet-marjoram, the root of the birthwort, and the seed of the hemp. Thus the relations of these plants with fishes confirm what has been said of those of their grains with the waters.

By

By referring the different tribes of insects to the different parts of plants, and in that way only, can we discern the reasons for which Nature has been determined to bestow on those diminutive animals figures so extraordinary. We should then comprehend the uses of their utensils, of which the greater part is hitherto unknown; and we should have continually new occasion to admire the Divine Intelligence, and to perfect our own. On the other hand, such progress in knowledge would diffuse the clearest light over many parts of plants, the utility of which is a world unknown to Botanists, because they have consonances only with animals.

I am persuaded that there is not a single vegetable but what has connected with it at least one individual of each of the six general classes of insects, acknowledged by Naturalists. As Nature has divided each genus of plants into different species, in order to render them capable of growing in different situations; she has in like manner divided each genus of insects into different species, in order to adapt them to inhabit different species of plants. For this reason she has painted and numbered in a thousand different but invariable ways, the almost infinite divisions of the same branch. For example, we constantly find on the elm the beautiful butterfly, called the gold-brocade, on account of it's rich colouring. That which goes by the name of the four omicrons, and which lives I know not where, always produces descendants impressed with that Greek character four times on their wings. There is a species of bee with five claws, which lives on radiated flowers only; with-

out those claws, she could not cling fast to the plane mirrors of those flowers, and load herself from their stamina, so easily as the common bee, which usually labours at the bottom of those with a deep corolla.

Not that I imagine any one plant nourishes in it's different varieties all the collateral branches of one family of insects. I believe that each genus of these extends much farther than the genus of plants which serves as it's principal basis. In this Nature manifests another of her Laws, by virtue of which she has rendered that the best which is the most common. As the animal is of a nature superior to the vegetable, the species of the first are more multiplied and more generally diffused than those of the second. For example, there are not so many as sixteen hundred species of plants in the vicinity of Paris; but within the same compass there are enumerated near six thousand species of flies. This leads me to presume therefore that the different tribes of plants cross with those of animals, which renders their species susceptible of different harmonies. Of this a judgment may be formed from the variety of tastes in birds of the same family. The black-headed yellow-hammer nestles in the ivy; the red-headed in walls in the neighbourhood of hemp-fields; the brown yellow-hammer builds on trees by the highway's side, where she finishes off her nest with horse hair. A dozen species of that bird are enumerated in our climates, each of which has it's particular department. Our different sorts of larks are likewise apportioned to different situations; to the woods, to the meadows, to the heaths, to arable lands, and to the shores of the Sea.

Very

Very interesting observations may be made respecting the duration of vegetables, which are unequal, though subjugated to the influences of the same elements. The oak serves as a monument to the nations; and the *nostocium*, which grows at his foot, lives only a single day. All I shall say upon this head in general is, that the period of their decay is by no means regulated in conformity to that of their growth; neither is that of their fecundity proportioned to their weakness, to climates, or to seasons, as some have pretended. *Pliny** quotes instances of holmes, of plane-trees, and of cypresses, which existed in his time, and which were more ancient than Rome, that is more than seven hundred years old. He farther tells us, that there were still to be seen near Troy, around the tomb of Ilus, oaks which had been there from the time that Troy took the name of Ilium, which carries us back to an antiquity much more remote.

I have seen in Lower Normandy, in a village churchyard, an aged yew planted in the time of *William* the Conqueror; it is still crowned with verdure, though it's trunk, cavernous and through and through pervious to the day, resembles the staves of an old cask. Nay there are bushes which seem to have immortality conferred upon them. We find in many parts of the kingdom hawthorns which the devotion of the Commonalty has consecrated by images of the Virgin, and which have lasted for several ages, as may be ascertained by the inscriptions upon the chapels reared in the vicinity.

* Natural History, book xvi. chap. 44.

But,

But in general Nature has proportioned the duration and the fecundity of plants to the demands of animal life. A great many plants expire as soon as they have yielded their seed, which they commit to the winds. There are some, such as mushrooms, whose existence is limited to a few days, as the species of flies which feed upon them. Others retain their seeds all the Winter through for the use of the birds; such are the fruits of most shrubs.

The fecundity of plants is by no means regulated according to their size; but proportionally to the fecundity of the animal species which is to feed upon them. The pannic and the small millet, and some other gramineous plants, so useful to man and beast, produce incomparably more grains than many plants both greater and smaller than themselves. There are many herbs which perpetuate themselves by their seeds only once a year; but the chickweed renovates itself by it's seeds up to seven or eight times, without being interrupted in the process even by Winter. It produces ripe seeds within six weeks from the time of it's being sown. The capsule which contains them then inverts itself, turning toward the earth, and half opens to leave them at liberty to be carried away by the winds and the rains, which sow them again every where. This plant insures the whole year through the subsistence of the small birds of our climates. Thus Providence is so much the more powerful as the creature is more feeble.

Other plants have relations to animals the more tenderly affecting, in proportion as climates and seasons seem to exercise over the animal the greater de-

gree

gree of severity. Werewe enabled to investigate these adaptations to the bottom, they would explain all the varieties of vegetation in every latitude, and in every season. Wherefore, for example, do most of the trees of the North shed their leaves in Winter; and wherefore do those of the South retain theirs all the year round? Wherefore, in defiance of the Winter's cold in the North, do the firs there continue always clothed with verdure? It is a matter of no small difficulty to discover the cause of this; but the end is obviously discernible. If the birch and the larch of the North drop their foliage on the approach of Winter, it is to furnish litter to the beasts of the forest; and if the pyramidical fir there retains it's leaves, it is to afford them shelter amidst the snows. This tree presents to the birds the mosses which are suspended on it's branches, and it's cones replenished with ripe kernels. In their vicinity oftentimes thickets of the service-tree display for their use the shining clusters of their scarlet berries.

In the Winters of our climates, many evergreen shrubs, as the ivy, the privet, and others, which remain loaded with black or red fruit, contrasting strikingly with the snow, as the primeprint, the thorn, and the eglantine, present to the winged creation both a habitation and food. In the countries of the Torrid Zone the earth is clothed with fresh liannes, and shaded with trees of a broad foliage, under which animals find a cool retreat. The trees themselves of those climates seem afraid of exposing their fruits to the burning heat of the Sun: instead of rearing them as a cone, or exhibiting them on the circum-

circumference of their heads, they frequently conceal them under a thick foliage, and bear them attached to their trunks, or at the sprouting of their branches: such are the *jacquier*, the banana, the palm-tree of every species, the *papayer*, and a multitude of others. If their fruits invite not the animals externally, by vivid colours, they call them by the noise which they excite. The lumpish cocoa-nut, as it falls from the height of the tree which bears it, makes the earth resound to a considerable distance. The black pods of the *caneficier* when ripe, and agitated by the wind, produce as they clash against each other, a sound resembling the tic-tac of a mill. When the grayish fruit of the genipa of the Antilles comes to maturity, and falls from the tree, it bounces on the ground with a noise like the report of a pistol.* Upon this signal, more than one guest no doubt resorts thither in quest of a repast. This fruit seems particularly destined to the use of the land-crabs, which are eagerly fond of it, and very soon grow fat on this kind of food. It would have answered no purpose for them to see it on the tree, which they are incapable of climbing: but they are informed of the moment when it is proper for food, by the noise of it's fall.

Other fruits, as the jacque and mango, affect the sense of smelling in animals so powerfully, as to be perceptible more than the quarter of a league distant, when the fruit is to windward. I believe that this property of emitting a powerful perfume is likewise common to such of our fruits as lie concealed under the foliage, apricots for instance. There are

* Father *du Tertre's* History of the Antilles.

other

other vegetables which manifest themselves to animals, if I may use that expression, only in the night-time. The jalap of Peru, or the belle of the night, opens not her strongly-scented flowers except in the dark. The flower of the nasturtium, or nun, which is a native of the same country, emits in the dark a phosphoric light, observed for the first time in Europe by a daughter of the celebrated *Linnæus*.

The properties of these plants convey a happy idea of those delightful climates, in which the nights are sufficiently calm, and sufficiently luminous to disclose a new order of society among animals. Nay there are insects which stand in no need of any pharos to assist them in steering their nocturnal courses. They carry their lanterns about them; such are the species of luminous flies. They scatter themselves sometimes in the groves of orange-trees, of papayas, and of other fruit-trees, in the midst of the darkest nights. They dart at once by several reiterated beatings of their wings, a dozen of fiery streams, which illuminate the foliage and fruits of the trees whereon they settle with a golden and bluish light;* then, all at once repressing their motion, they plunge again into obscurity. They alternately resume and intermit this sport during the whole night. Sometimes there are detached from them swarms of brilliant sparks of light, which rise into the air like the emanations of a firework.

Were we to study the relations which plants have to animals, we should perceive in them the use of many of the parts which are frequently considered as

* Consult the same Work of *Du Tertre*.

pro-

productions of the caprice and of the confusion of Nature. So widely extended are those relations, that it may be confidently affirmed that there is not a down upon a plant, not an intertexture of a shrub, not a cavity, not a colour of leaf, not a prickle, but what has it's utility. Those wonderful harmonies are especially to be remarked with relation to the lodgings and the nests of animals. If in hot countries there are plants loaded with down, it is because there are moths entirely naked, which clip off their fleece and weave it into clothing. There is found, on the banks of the Amazon, a species of reed from twenty-five to thirty feet high, the summit of which is terminated by a large ball of earth. This ball is the workmanship of the ants, which retire thither at the time of the rains, and of the periodical inundations of that river: they go up, and descend along the cavity of this reed, and live on the refuse which is then swimming around them on the surface of the water.

It is, I presume, for the purpose of furnishing similar retreats to many small insects, that Nature has hollowed the stems of most of our plants of the shore. The valisneria,* which grows in the stream

* Consult, with regard to the Valisneria, the voyage of an anonymous English traveller performed in the year 1750, to France, Italy, and the Islands of the Archipelago, in four small volumes, vol. 1. It is stored with judicious observations of every kind. Consult likewise, respecting the genipa, and the different fruits, plants, and animals of southern countries, the sprightly Father *du Tertre*, the patriotic Father *Charlevoix*, *John de Laet*, the Historian, and all travellers who have written on the subject of Nature, without the spirit of system, assisted by the light of reason alone.

of

of the Rhone, and carries it's flower on a spiral stem, capable of being drawn out in proportion to the rapidity of the sudden swellings of that river, has holes pierced through at the basis of it's leaves, the use of which is much more extraordinary. If you take up this plant by the root, and put it into a large vessel full of water, you perceive at the basis of it's leaves masses of bluish jelly, which insensibly lengthen into pyramids of a beautiful red. These pyramids presently furrow themselves into flutings, which disengage from the summit, invert themselves all around, and present, by their expansion, very beautiful flowers formed of purple, yellow, and blue rays. By little and little, each of these flowers advances out of the cavity in which it is partly contained, and withdraws to some distance from the plant, remaining however attached to it by a small filament. You then perceive each of the rays of which those flowers are composed assume a motion peculiar to itself, which communicates a circular movement to the water, and precipitates to the centre of each of them all the small bodies which are floating around. If those wonderful expansions are disturbed by any sudden shock, immediately every filament contracts, all the rays close, and all the pyramids retire into their cavities; for those pretended flowers are polypuses.

There are in certain plants parts which may be considered as characters of uncultivated Nature, but which are, like all the rest of her Works, evident proofs of the wisdom and providence of her AUTHOR; such are the prickles. Their forms are varied without end,

end, especially in hot countries. Some are shaped like saws, like hooks, like needles, like the head of a halberd, and like caltrops. Some of them are round like awls, some triangular, like the shoemaker's piercer, and some flattened like a lancet. There is no less variety in their aggregations. Some are arranged on the leaves in balls, like those of the opuntia; others in stripes, like those of the Peruvian taper. Some are invisible, as those of the shrub of the Antilles, known by the name of captain's-wood. The leaves of this formidable plant appear on the upper side smooth and shining: but they are covered on the under side with very delicate prickles, which are inserted in such a manner, that apply your hand to them ever so cautiously, it is impossible to avoid pricking your fingers.

There are other thorns planted only on the stems of plants, others are on their branches. In our climates they are scarcely ever to be found, except on shrubbery, and on a few trees; but in both Indies they are scattered over a great many species of trees. Their very various forms and dispositions have relations, of which the greatest part are to us unknown, to the security and defence of the birds which live upon them. It was necessary that many of the trees of those countries should be armed with thorns, because many quadrupeds are there to be found capable of climbing them to eat the eggs and the young of birds, such as the monkey, the civet-cat, the tiger, the wild-cat, the musk-rat, the opossum, the wild rat, and even the common rat.

The

The Asiatic acacia* presents to it's winged inhabitants a retreat absolutely inaccessible to their enemies. It bears no prickles on it's trunk, and in it's branches; but at the height of ten or twelve feet, precisely at the place where the tree begins to branch off, there is a belt of several rows of large thorns, from ten to twelve inches in length, presenting an impenetrable rampart of spikes nearly resembling the iron head of a halberd. The collar of the tree is encircled by it in such a manner, that it is impossible for any quadruped to get up. The acacia of America, improperly called the false-acacia, has it's prickles formed into hooks, and scattered over its branches, undoubtedly from some unknown relation of opposition to the species of quadruped which makes war on the bird that inhabits it.

There are in the Antilles Islands trees which have no thorny prickles, but which are much more ingeniously protected than if they had. A plant known in those countries by the name of the prickly thistle, which is a species of creeping taper, attaches it's roots, similar to filaments, to the trunk of one of those trees, and runs to the ground all around it, to a consider-

* There is a plant of the Asiatic acacia to be seen in the beautiful garden adjacent to the iron gate of Chaillot which formerly belonged to the virtuous Chevalier de *Gensin*. As to the name of *false-acacia*, given to the acacia of America, I must observe that Nature produces nothing false. She has given varieties of all her productions, in all Countries, in order to bestow upon them relations adapted to the elements and to animals; and when we do not find in these the characters which we have assigned to them, the charge of falshood is not in justice to be fixed on her Works, but on our systems.

able distance, crossing it's branches one over another, and forming an enclosure of them which no quadruped dares to approach. It likewise produces a fruit very grateful to the palate. On beholding a tree, the foliage of which is harmless, filled with birds that have there fixed their habitation, surrounded about the roots by one of those prickly thistles, you are presented with the idea of one of those commercial defenceless cities, apparently accessible on every side, but protected all around by a citadel, encompassing it with extended entrenchments. Thus the tree is on one side, and it's thorn on the other.

Quadrupeds which live on the eggs of birds would be reduced to great distress, did not Nature sometimes produce on the summits of those very trees, a vegetable of very extraordinary form which opens a passage to them. It is in every respect the opposite of the prickly thistle. It consists of a root of two feet in length, as thick as a man's leg, pricked, as if pierced with a bodkin, and adhering to a branch of the tree by a multitude of filaments, somewhat in the same way that the prickly thistle is affixed to the under part of it's trunk. Like the other, it derives it's nourishment from the tree, and emits from ten to twelve great leaves in form of a heart, of about three feet in length and two in breadth, resembling the leaves of the nymphæa. Father *du Tertre* calls it the false root of China. What is still more extraordinary, it lets fall from the top of the tree on which it is placed in a perpendicular direction, very strong cordage of the size of a quill the whole length through, which takes root on reaching the ground.

The

The plant itself emits no smell, but this cordage savours strongly of garlic. Undoubtedly, when a monkey or some such clambering animal perceives this broad standard of verdure, to no purpose does the tree oppose around it's root a fortification of thorns, this signal announces that he has a friend within the fortress: the smell of the cordage, which descends down to the ground, directs him to the scaling ladder, even during the night; and while the birds are sleeping in security on their nests, confident in the strength of their bulwark, the enemy gets possession of the town through the suburbs.

In those countries, the thorns upon the trees afford protection even to the insects. Bees there carry on their honey-making processes in the aged trunks of prickly trees hollowed by the hand of Time. It is very remarkable that Nature, who has provided this resource for the bees of America, has with-held from them a sting, as if those on the trees were sufficient for their defence. I believe that to this reason it may be ascribed, though no attention has been paid to it, that we have never hitherto been able to rear in the Antilles Islands the honey bees of the country. They refused no doubt to take up their abode in domestic hives, because they did not consider themselves as there in a state of security; but might perhaps have been induced to make that choice, had the hives to which they were invited been decorated and defended by thorns.

If Nature employs prickly vegetables for the defence even of flies against the attacks of quadrupeds, she sometimes makes use of the same means for de-

livering quadrupeds from the persecution of common flies. She has in truth bestowed on those which are the most exposed to it, manes and tails armed with long hair, to drive them away; but the multiplication of those insects is so rapid in warm and humid seasons and countries, as to threaten destruction to the whole race of animals. One of the vegetable barriers opposed to them by Nature is the *dionæa muscipula*. This plant bears on one and the same branch opposite little leaves, besmeared with a sugary liquor resembling manna and studded with very sharp prickles. When a fly perches on one of those little leaves, they instantly close with a spring, like the jaws of a wolf-trap, and the fly is spitted through and through.

There is another species of the dionœa which catches those insects with it's flowers. When a fly attempts to extract it's nectareous juices, the corolla, which is tubulous, shuts at the collar, seizes the insect by the proboscis, and thus puts it to death. This plant is cultivated in the Royal-Garden. It is observable, that it's cup-formed flower is white radiated with red, and that these two colours universally attract flies, from their natural avidity of milk and of blood.

There are aquatic plants armed with thorns proper for catching fishes. You may see in the Royal Garden an American plant called *martinia*, the flower of which has a very agreeable odour, and which, from the form of it's rounded leaves, the sleekness of their tails and of their stems, has all the aquatic characters which have been indicated. It has this farther character peculiar to itself, that it transpires so copiously

as

as to appear to the touch in a state of continual humidity. I can have no doubt therefore that this plant grows in America on the brink of the water. But the shell which envelopes it's seed possesses a very extraordinary nautical character. It resembles a fish half-dried, white and black, with a long fin upon the back. The tail of this fish is drawn out into great length, and terminates in a very sharp point, bent into the form of a fish-hook. This tail usually separates into two, and thus presents a double hook. The configuration of this vegetable fish is completely similar in size and in form to the hook which is employed at sea for catching goldneys, and at the head of which is figured in linen, a flying-fish, with this exception, that the goldney-hook has but one curve and barb, whereas the shell of the martinia has two, which must render it's effect more infallible. This shell contains several black seeds, shrivelled, and similar to the globules of the sheep's dung flattened.

As I possess but few books on Botany, I did not know of what country the martinia was a native; but having lately consulted the Work of *Linnæus*, I find that we got it from Vera-Cruz. The celebrated Naturalist whom I have just mentioned, discovers in this shell no resemblance but that of a woodcock's head; but had he ever seen the hook for goldneys he could not possibly have hesitated about preferring this similitude in the appearance, in as much as the extremity of this pretended beak bends back into two hooks, which prick like needles, and are, as well as the whole shell, and the tail by which it is united

to the stem, of a ligneous and horny substance not easily broken asunder. *John de Laet** tells us, that the land of Vera-Cruz is on a level with the Sea, and that it's port, called St. *John de Hulloa*, is formed by a small island no higher than the water; so that, says he, when the tide rises very high, the land wholly disappears.

Such inundations are very common at the bottom of the Gulf of Mexico, as we learn from the relation which *Dampier* has given us of the bay of Campeachy, which is in that vicinity. Hence I presume that the martinia which grows on the inundated shores of Vera-Cruz, has certain relations, which we know nothing of, to the fishes of the Sea; in as much as the seeds of several trees and plants of those countries, described by *John de Laet*, possess very curious nautical forms. A drawing of the martinia, taken from nature, is presented fronting page 152 of this Volume.

But there is no occasion to resort to foreign plants for ascertaining the existence of vegetable relations to animal. The bramble, which affords in every field through which we pass a shelter to so many birds, has it's prickles formed into hooks; so that it not only prevents the cattle from disturbing the birds' retirement, but frequently lays them under contribution for a flake of wool or hair proper for finishing off their nests, as a reprisal for hostility committed, and an indemnification for damages sustained. *Pliny* alleges that this gave rise to the pretended animosity

* History of the West-Indies, book v. chap. 18.

between

between the linnet and the ass. This quadruped, whose palate is proof against prickles, frequently browses on the shrub in which the linnet builds her nest. She is so terrified at his voice, that on hearing it, says he, she kicks down her eggs; and her callow brood die with the terror of it. But she makes war upon him in her turn, by fixing her attack on the scratches made in his hide by the prickles, and by picking the flesh in those tender parts to the very bone. It must be a very amusing spectacle to view the combat between the little melodious songster and the dull, braying, but otherwise inoffensive animal.

Did we know the animal relations of plants, we should possess sources of intelligence respecting the instincts of the brute creation with which we are totally unacquainted. We should know the origin of their friendships and of their animosities, at least as to those which are formed in society; for with regard to such as are innate, I do not believe that the cause of them was ever revealed to any man. These are of a different order, and belong to another world. How should so many animals have entered into life under the dominion of hatred, without having been offended; furnished with skill and industry, without having served an apprenticeship; and directed by an instinct more infallible than experience? How came the electrical power to be conferred on the torpedo, invisibility on the cameleon, and the light of the stars themselves on a fly? Who taught the aquatic-bug to slide along the waters, and another species of the same denomination to swim upon the back; both the one and the other for catching their prey, which

hovers along the surface? The water-spider is still more ingenious. She incloses a bubble of air in a contexture of filaments, takes her station in the middle and plunges to the bottom of the brook, where the air-bubble appears like a globule of quick-silver. There she expatiates under the shade of the nymphæa, exempted from the dread of every foe. If in this species two individuals different in sex happen to meet and to suit each other, the two globules, being in a state of approximation, become united into one, and the two insects are in the same atmosphere. The Romans who constructed on the shores of Baiæ saloons underneath the waves of the Sea, in order to enjoy the coolness and the murmuring noise of the waters, during the heats of Summer, were less dextrous and less voluptuous. If a man united in himself those marvellous faculties which are the portion of insects, he would pass for a god with his fellow-creatures.

It is of importance for us to be acquainted with at least such insects as destroy those which are offensive to Man. We might turn their mutual hostility to good account, by converting it into the means of our own repose. The spider catches the flies in nets; the formicaléo surprises the ants in a tunnel of sand; the four-winged ichneumon seizes the butterfly on the wing. There is another ichneumon, so small and so cunning, that it lays an egg in the anus of the vine-fretter. Man has it in his power to multiply at pleasure the families of insects which are useful to him; and may find means of diminishing such as make depredations on his agricultural possessions. The small

birds

birds of our groves tender him, to the same effect, services of still greater extent, and accompanied with other circumstances inexpressibly agreeable. They are all directed by instinct to live in this vicinity, and about the pastures and habitations of his flocks and herds. A single species of them might frequently be sufficient to protect the cattle from the insects which infest them through the Summer.

There is in the North a gadfly, called *Kourbma* by the Laplanders, and by the Learned, *œstrus rangiferinus*, which torments the domestic rein-deer to such a degree as to force them in agony to the mountains, and sometimes actually plagues them to death, by depositing it's eggs in the skin of the animal. Many dissertations have, as the custom is, been composed on this subject, but no remedy for the evil has been proposed. I am convinced there must be birds in Lapland which would deliver the rein-deer from this formidable insect, did not the Laplanders terrify them away by the noise of their fowling-pieces. These arms of civilized Nations have overspread with barbarism all our plains. The birds, destined to embellish the habitation of Man, withdraw from it, or approach with timidity and mistrust. The sound of musquetry ought to be prohibited at least around the haunts of the harmless cattle. When the birds are not scared away by the fowler they follow their instincts.

I have frequently seen in the Isle of France a species of starling, called martin, imported thither from India, perch familiarly on the back and horns of the oxen to pick them clean. To this bird that island stands indebted at the present day for the destruction of

of the locusts, which in former times committed such ravages upon it. In those of our European rural scenes which still exhibit, on the part of Man, some degree of hospitality toward the innocent warblers, he has the pleasure of seeing the stork build her nest on the ridge of his house, the swallow flutter about in his apartments, and the wagtail, along the bank of the river, frisk around his sheep to protect them from the gnats.

The foundation of all this variety of pleasant and useful knowledge is laid in the study of plants. Each of them is the focus of the life of animals, the species of which there collect in a point as the rays of a circle at their centre.

As soon as the Sun, arrived in his annual progression at the sign of the Ram, has given the signal of Spring to our Hemisphere, the rainy and warm wind of the South takes it's departure from Africa, swells the Seas, elevates the rivers above their banks, so that they inundate the adjacent plains, and fatten them with their fertilizing slime; and levels in the forests the aged trees, the decayed trunks, and every thing that presents an obstacle to future vegetation. It melts the snows which cover our fields, and forcing it's way to the very Pole, it breaks to pieces and dissolves the enormous masses of ice which Winter had there accumulated. When this revolution, known all over the Globe by the name of the equinoctial gale, has taken place in the month of March, the Sun revolves night and day around our Pole, so that there is not a single point in the whole northern Hemisphere that can escape his heat.

Every

Every step he advances in his course through the Heavens a new plant makes it's appearance on the Earth. Each of them arises in succession, and occupies it's proper station at the hour assigned to it; at one and the same instant it receives the light in it's flowers and the dew of Heaven on it's foliage In proportion to it's progress in growth, the different insect tribes which thence derive their nourishment likewise display their existence, and unfold their characters. At this epocha too each species of bird resorts to the species of plant with which she is acquainted, there to build her nest, and to feed her young with the animal prey which it presents to her, to supply the want of the seeds which it has not as yet produced. We presently behold the tribes of birds of passage flock thither in quest of the portion which Nature has provided for them likewise. First comes the swallow to preserve our habitations from the vermin, by planting her nest around us. The quail forsakes Africa, and grazing the billows of the Mediterranean in troops innumerable, is scattered over the boundless meadows of the Ukraine. The heathcock pursues his course northward as far as Lapland. The wild ducks and geese, the silvery swans, forming long triangular squadrons in the air, advance to the very islands adjacent to the Pole. The stork, in former times adored in Egypt, which she abandons, crosses over Europe, halting here and there to take repose, even in great cities, on the roofs of the houses of hospitable Germany. All these birds feed their young on the insects and reptiles which the newly expanded plants have fostered into life.

Then

Then too it is that the fishes issue in legions from the northern abysses of the Ocean, allured to the mouths of rivers by clouds of insects, which are confined entirely to their waters, or expand into life along their banks. They stem the watery current in shoals, and advance, skipping and springing, up to the very sources of the stream; others, as the north-capers, suffer themselves to be swept into the general current of the Atlantic Ocean, and appear in form of a ship's bottom on the coasts of Brasil, and on those of Guinea.

Quadrupeds themselves likewise then undertake long peregrinations. Some proceed from the South to the North, with the Sun; others from East to West. There are some which coast along the rugged chains of mountains; others follow the courses of rivers which have never been navigated. Lengthened columns of black cattle pasture in America, along the banks of the Mechassipi, which they cause to resound with their bellowing. Numerous squadrons of horses traverse the rivers and the deserts of Tartary; and wild sheep stray bleating amidst it's vast solitudes. These flocks have neither overseer nor shepherd to guide them through the desert, to the music of the pipe: but the expansion of herbage which they know, determines the moment of their departure, and the limits of their progress. It is then that each animal inhabits his natural situation, and reposes under the shade of the vegetable of his fathers. It is then that the chains of harmony exert all their force, and that all, being animated by consonances, or by contrasts, the air, the waters, the forests, and the rocks,

seem

seem to be vocal, to be impassioned, to be transported with delight.

But this vast concert can be comprehended by celestial Intelligences only. To Man it is sufficient, in order to study Nature with advantage, that he limit his researches to the study of one single vegetable. It would be necessary for this purpose to make choice of an aged tree in some solitary situation. From the characters which have been indicated, a judgment might easily be formed whether it be in it's natural position; but still better from it's beauty, and from the accessories which Nature uniformly places in connection with it, where the hand of Man has not interposed to derange the operations. The student would first observe it's elementary relations, and the striking characters which distinguish the different species of the same genus, some of which grow at the sources of rivers, and others at the place of their discharge into the Ocean. He would afterwards examine it's convolvuluses, it's mosses, it's mistletoes, it's scolopendræ, the mushrooms of it's roots, nay the very grasses which grow under it's shade. He would perceive in each of it's vegetables new elementary relations, adapted to the places which they occupy, and to the tree which sustains or shelters them.

His attention might next be directed to the various species of animals which resort to it as a habitation, and he would presently be convinced, that from the snail up to the squirrel, there is not a single one but what has determinate and characteristic relations to the dependencies of it's vegetation.

If the tree in question were growing in a forest, itself

itself too of considerable antiquity, it would most probably have in it's vicinity the tree which Nature designed should contrast with it in the same site, as for example the birch with the fir. It is farther probable that the accessory vegetables and animals of this last, would in like manner form a contrast with those of the first. These two spheres of observation would mutually illuminate each other, and would diffuse the clearest light over the manners of the animals which frequent them. We should then have a complete chapter of that immense and sublime History of Nature, the alphabet of which is hitherto unknown to us.

I am fully convinced that without fatigue, and almost without any trouble, discoveries the most curious might be made. Were we to restrict our enquiries but to one single compartment, we should discover a multitude of the most enchanting harmonies. In order to enjoy some imperfect sketches of this kind we must have recourse to travellers. Our Ornithologists, fettered by methods and system, only think of swelling their catalogue, and distinguish nothing in birds save the feet and the bill. It is not in the nests that they observe them, but in hunting, and in their pouch. They even consider the colours of their plumage as accidents. It was not by chance however that Nature, on the shores of Brasil, bestowed a beautiful carnation colour, with a border of black, on the extremity of the wings of the *Ouara*, a species of curlew inhabiting the sea-green foliage of the *paletuvier*, which grows in the bosom of the waves, and bears no apparent flowers. The *savia*, another bird of

of the same climate, is yellow over the belly, with the rest of the plumage gray. It is about the size of a sparrow, and perches on the pepper-plant, the flowers of which have no lustre, but whose grains are eaten by this bird, and re-sown wherever she takes her flight.

To those correspondences must be added such as pertain to site, which itself derives so much beauty from the overshadowing vegetable. These harmonies are detailed by Father *Francis d'Abbeville*. If credit is to be given to the History of Voyages by the Abbé *Prevost*, there is on the banks of the Senegal a fluviatic tree, the leaves of which are thorny, and the branches pendent, in form of an arch. It serves as a habitation to birds called kurbalos, or fishers, of the size of a sparrow, variously coloured. Their bill is very long, and armed with little teeth resembling a saw. They build a nest of the bulk of a pear, composed of earth, feathers, straw, moss, and attach it to a long thread, suspended from the extremity of the branches which project over the river, in order to secure it from the serpents and monkeys, which sometimes contrive to clamber up after them. You would take those nests, at a little distance, for the fruit of the tree: and some of those trees contain to the number of a thousand. You perceive the kurbalos fluttering incessantly along the water, and entering into their nests with a motion that dazzles the eyes.

According to Father *Charlevoix*, there grows in Virginia, on the brink of the lakes, a laurel-leafed yew-tree which pushes several stems from it's root, the

the branches of which embrace all the surrounding trees, and climb to the height of more than sixteen feet. They form in Summer an impenetrable shade, and in Winter a temperate retreat for the birds. It's flowers have no very striking appearance, and it's fruit grows in round clusters, loaded with black grains. This yew has for it's principal inhabitant a very beautiful kind of jay. The head of that bird is adorned with a long black crest which it can erect at pleasure. It's back is of a deep purple. The wings are black on the inside, blue externally, and white at the extremities, with white stripes across every feather. It's tail is blue and marked with the same stripes as the wings; and it's cry is far from being disagreeable.

There are birds which lodge not upon their favourite plant, but opposite to it. Such is the colibri, which frequently nestles, in the Antilles Islands, on the straw which thatches a cottage, in order to live under the protection of Man. In our climates, the nightingale constructs his nest under covert of a bush, choosing in preference such situations as repeat an echo, and carefully observing to expose it to the morning sun. Having employed such precautions, he takes his station in the vicinity, against the trunk of a tree; and there, confounded with the colour of it's bark, and motionless, he becomes invisible. But he presently animates the obscure retreat which he has chosen by the divine melody of his song, and effaces all the brilliancy of plumage by the charms of his music.

But whatever enchantment may be diffused by plants and animals over the situations which have been

been assigned to them by Nature, I never can consider a landscape as possessing all it's beauty unless I perceive in it at least one little hut. The habitation of Man confers on every species of vegetable a new degree of interest or of majesty. Nothing more is necessary in many cases than a tree, in order to characterize in a country the wants of a whole Nation, and the care of Providence. I love to see the family of an Arab under the date-tree of the desert, and the boat of an islander of the Maldivias loaded with cocoa-nuts, under the cocoa-trees of their gravelly strands. The hovel of a poor un-industrious Negro gives me pleasure, under the shade of a great gourd-plant, which exhibits his complete set of household furniture. Our magnificent hotels in great cities are the habitations of tradesmen merely: in the country, they are transformed into castles, palaces, temples. The long avenues which announce them confound themselves with those which form the communication of empires. This is not in truth what I consider as most interesting in rural scenery. To the most ostentatious exhibition of splendor I have frequently preferred the view of a little hamlet of fishermen, built by the side of a river. With inexpressible delight, have I sometimes reposed under the shade of the willows and of the poplars, on which were suspended the bow-nets composed of their own branches.

I shall now proceed in my usual superficial manner, to take a rapid glance of the harmonies of plants with man; and that I may introduce at least something of order into a subject so rich in matter, I shall farther divide those harmonies, relatively to Man him-

self, into *elementary*, into *vegetable*, into *animal*, and into *human*, properly so called, or *alimentary*.

HUMAN HARMONIES OF PLANTS.

Elementary Harmonies of Plants relatively to Man.

If we consider the vegetable Order under the simple relations of strength and of magnitude, we shall find it divided with a sufficient degree of generality, into three great classes, namely, into herbs, into shrubs, and into trees. It is to be remarked, in the first place, that herbs are of a substance pliant and soft. Had they been ligneous and hard, like the young boughs of trees, to which it might appear they ought naturally to have a resemblance, as they grow on the same soil, the greatest part of the Earth would have been inaccessible to the foot of Man, till the fire or the hatchet had cleared the way for him. It was not by chance therefore that so many grasses, mosses, and herbs, assumed a soft and yielding texture, nor from want of nourishment, or of the means of expansion; for some of those herbs rise to a very great height, such as the banana of India, and several ferulaceous plants of our own climates, which attain the stature of a little tree.

On the other hand, there are ligneous shrubs which do not exceed the generality of herbs in height; but they grow for the most part on rugged and steep places affording to Man the means of clambering up with facility, for they shoot out of the very clefts of the rocks. But as there are rocks which have no clefts, and which present the perpendicularity of a wall

wall, there are likewise creeping plants which take root at their bases, and which, fixing themselves to their sides, rise in close cohesion to a height surpassing that of many of the tallest trees: such are the ivy, the virgin-vine, and a great number of the *lianne* tribe, which mantle along the rocks of southern regions.

Were the Earth covered with vegetables of this sort, it would be impossible to walk over it. It is very remarkable that when uninhabited islands were discovered, some were found clothed with forests, as the Island of Madeira; others in which there was nothing but herbage and rushes, as the Malouine Islands, at the entrance of Magellan's Strait; others carpeted with mosses simply, such as several little isles on the coasts of Spitsbergen; others, in great number, on which these several vegetables were blended; but I do not know of a single one which was found to contain only shrubbery and liannes. Nature has placed this class only on places not easily to be scaled, in order to facilitate access to Man. It may be affirmed that no precipice presents a surface so perpendicular as to be insurmountable with their assistance. Thus aided the ancient Gauls were on the point of storming the capitol.

As to trees, though they are replenished with a vegetative force which elevates them to a very considerable height, the greater part of them do not send out their first branches but at a certain distance from the ground. So that though they form, when they have attained a certain degree of elevation, an intertexture impenetrable to the Sun, which they extend

to a great distance around, they leave however about their roots, avenues sufficient to render them accessible, so that the forests may be traversed with ease and expedition.

Such then are the general dispositions of vegetables upon the Earth, relatively to the occasion which Man had to range over it. The herbage serves as a carpet to his feet; the shrubbery as a scaling ladder to his hands; and the trees are so many parasols over his head. Nature, after having established those proportions between them, has distributed them in all the varieties of situation, by bestowing on them, abstractedly from their particular relations to the elements, and to the animal creation, qualities the best adapted to minister to the necessities of Man, and to compensate in his favour the inconveniencies of climate.

Though this manner of studying her Works be now held in contempt by most Naturalists, to it however shall our researches be limited. We have just been considering plants according to their shape and size, after the manner of gardeners; we proceed farther to examine them as is done by the wood-feller, the huntsman, the carpenter, the fisherman, the shepherd, the sailor, nay, the nosegay-maker. It is of small importance whether we be learned, provided we cease not to be men.

It is in the countries of the North, and on the summit of cold mountains, that the pine grows, and the fir and the cedar, and most part of resinous trees which shelter man from the snows by the closeness of their foliage, and which furnish him during the Winter

ter season with torches, and fuel for his fire-side. It is very remarkable that the leaves of those evergreen trees are filiform, and extremely adapted by this configuration, which possesses the farther advantage of reverberating the heat like the hair of animals, for resistance to the impetuosity of the winds that beat with peculiar violence on elevated situations. The Swedish Naturalists have observed that the fattest pines are to be found on the dryest and most sandy regions of Norway. The larch, which takes equal pleasure in the cold mountains, has a very resinous trunk.

Mathiola, in his useful commentary on *Dioscorides*, informs us, that there is no substance more proper than the charcoal of those trees for promptly melting the iron minerals, in the vicinity of which they peculiarly thrive. They are besides loaded with mosses, some species of which catch fire from the slightest spark. He relates, that being obliged on a certain occasion to pass the night in the lofty mountains of the Strait of Trento, where he was botanizing, he found there a great quantity of larches *(larix)* bearded all over, to use his own expression, and completely whitened with moss. The shepherds of the place willing to amuse him, set fire to the mosses of some of those trees, which was immediately communicated with the rapidity of gun-powder touched with the match. Amidst the obscurity of the night, the flames and the sparks seemed to ascend up to the very Heavens. They diffused, as they burnt, a very agreeable perfume. He farther remarks, that the best agaricum grows upon the larch, and that the arque-

busiers of his time made use of it for keeping up fire, and for making matches. Thus Nature, in crowning the summit of cold and ferruginous mountains with those vast vegetable torches, has placed the match in their branches, the tinder at their foot, and the steel at their roots.

To the South, on the contrary, trees present in their foliage, fans, umbrellas, parasols. The latanier carries each of it's leaves painted as a fan, attached to a long tail, and similar, when completely displayed, to a radiating Sun of verdure. Two of those trees are to be seen in the Royal Garden. The leaf of the banana resembles a long and broad girdle, which undoubtedly procured for it the name of Adam's fig-tree. The magnitude of the leaves of several species of trees increases in proportion as we approach the Line. That of the cocoa-tree with double fruit, of the Sechelles islands, is from twelve to fifteen feet long, and from seven to eight broad. A single one is sufficient to cover a numerous family. One of those leaves is likewise to be seen in the Royal Cabinet of Natural History. That of the talipot of the island of Ceylon is of nearly the same size.

The interesting and unfortunate *Robert Knox*, who has given the best account of Ceylon which I am acquainted with, tells us, that one of the leaves of the talipot is capable of covering from fifteen to twenty persons. When it is dry, continues he, it is at once strong and pliant, so that you may fold and unfold it with pleasure, being naturally painted like a fan. In this state it is not bigger than a man's arm, and extremely light. The natives cut it into triangles, though

though it is naturally round, and each of them carries one of those sections over his head, holding the angular part before, in his hand, to open for himself a passsage through the bushes. The soldiers employ this leaf as a covering to their tents. He considers it and with good reason, as one of the greatest blessings of Providence, in a country burnt up by the Sun, and inundated by the rains for six months of the year.

Nature has provided in those climates parasols for whole villages; for the fig-tree, denominated in India the fig-tree of the Banians, a drawing of which may be seen in *Tavernier*, and in several other travellers grows on the very burning sand of the seashore, throwing from the extremity of it's branches a multitude of shoots, which drop to the ground, there take root, and form around the principal trunk, a great number of covered arcades, whose shade is impervious to the rays of the Sun.

In our temperate climates we experience a similar benevolence on the part of Nature. In the warm and thirsty season, she bestows upon us a variety of fruits replenished with the most refreshing juices, such as cherries, peaches, melons; and as Winter approaches, those which warm and comfort by their oils, such as the almond and the walnut. Certain Naturalists have considered even the ligneous shells of those fruits as a preservative against the cold of the gloomy season; but these are, as we have seen, the means of floating and of navigating. Nature employs others, with which we are not acquainted, for preserving the substances of fruits from the im-

pressions of the air. For example, she preserves through the whole Winter many species of apples and pears, which have no other covering than a pellicle so very thin that it is impossible to determine how fine it is.

Nature has placed other vegetables in humid and in dry situations, the qualities of which are inexplicable on the principles of our Physics, but which admirably harmonize with the necessities of the men who inhabit those places. Along the water's-side grow the plants and the trees which are the dryest, the lightest, and consequently the best adapted to the purpose of crossing the stream. Such are reeds which are hollow, and rushes which are filled with an inflammable marrow. It requires but a very moderate bundle of rushes to bear the weight of a very heavy man upon the water. On the banks of the lakes of the North are produced those enormous birch-trees, the bark of a single one of which is sufficient to form a large canoe. This bark is similar to leather in pliancy, and so incorruptible by humidity, that in Russia I have seen some of it extracted from under the earth which covered powder magazines, perfectly sound, though it had lain there from the time of *Peter* the Great.

If we may depend on the testimony of *Pliny* and of *Plutarch*, there were found at Rome, four hundred years after the death of *Numa*, the books which that great King had commanded to be deposited with his body in the tomb. The body was entirely consumed; but the books, which treated of Philosophy and Religion, were in such a state of preservation that

that *Petilius*, the Pretor, undertook to read them by command of the Senate. On the report which he made respecting their contents, they were ordered to be burnt. They were written on the bark of the birch-tree. This bark consists of an accumulation of ten or twelve sheets, white and thin like paper, the place of which it supplied to the ancients.

Nature presents to Man different trajectiles on different shores. She has planted on the banks of the rivers of India the bamboo, an enormous reed which rises there sometimes to the height of sixty feet, and swells to the size of a man's thigh. The part comprehended between two of it's joints is sufficient to bear a man up on the water. The Indian places himself upon it a-straddle, and so crosses a river, swimming along by the motion of his feet. The Dutch Navigator, *John Hugo de Linschoten*, an author of reputation, assures us that the crocodile never touches persons who are passing rivers in this manner, though he frequently attacks canoes, and even the boats of Europeans. *Linschoten* ascribes the abstinence of this voracious animal to an antipathy which he has to that species of reed.

Francis Pyrard, another traveller, who has observed Nature with a careful eye, informs us that there grows on the shores of the Maldivia Islands a tree called *candou*, the wood of which is so light that it serves as cork for the fishermen.* I think I was once possessed of a log of wood of that species. It was stripped of the bark, perfectly white, of the thickness of my arm, about six feet long, and so light that I

* See *Pyrard*'s Voyage to the Maldivia Islands, page 38.

could

could easily lift it by my finger and thumb. In these same islands, and on the same strands, rises the cocoa-tree, which there attains a higher degree of beauty than any where else in the World. Thus the tree of all others most useful to mariners grows on the shores of the Seas most frequented by men of that description. All the world knows that the vessel is there constructed of it's timber, that it's leaves are formed into sails, that the trunk serves for a mast, that the hempen substance called *caira*, which surrounds it's fruit, is wrought into cordage, and when the whole is ready for sea, a cargo of cocoa-nuts is the lading. It is farther remarkable that the cocoa-nut, before it comes to perfect maturity, contains a liquor which is an excellent antiscorbutic.

Is it not then a miracle of Nature, that this fruit, replenished with such milk, should come to perfection on the barren strand, and within the washing of the briny Deep? Nay it is only on the brink of the Sea that the tree which bears it arrives at it's highest beauty; for few are to be seen in the interior of countries.

Nature has placed a palm-tree of the same family, but of a different species, on the summit of the mountains of the same climates: it is the palmist. The stem of this tree is sometimes above a hundred feet high, it is perfectly straight, and bears on it's summit all the foliage which it has, a bunch of palms, from the midst of which issues a long roll of painted leaves resembling the staff of a lance. This roll contains, in a sort of coriaceous sheath, leaves ready to shoot, which are very good for eating before their expansion.

expansion. The trunk of the palmist is woody only at the circumference, and it is so hard as to resist the edge of the best tempered hatchet. It may be cleft with the utmost ease from end to end, and is filled inwardly with a spongy substance which may be easily separated. Thus prepared it serves to form, for conducting waters frequently diverted from their course by the rocks which are at the summit of mountains, tubes which are not corruptible by humidity. Thus the palm tree gives to the inhabitants of those regions the means of constructing aqueducts at the source of rivers, and ships at the place of their discharge.

Other species of trees render them the same services in other situations. On the shores of the Antilles Islands grows the *acajou*, there called, but improperly the cedar, on account of it's incorruptibility. It arrives at such a prodigious size, that out of one log of it they make a boat capable of carrying so many as forty men.* This tree possesses another quality, which in the judgment of the best observers ought to render it invaluable for the marine service; namely this, it is the only one of those shores which is never attacked by the sea-worm, an insect so formidable to every other species of timber which floats in the seas of that region, as to devour whole squadrons in a very little time, and in order to preserve them, lays us under the necessity for many years past, of sheathing their bottoms with copper. But this beautiful tree has found enemies more dreadful than the worm, in the European inhabitants of those

* Consult Fathers *Labat* and *Du Tertre*.

Islands,

Islands, who have almost extirpated the whole race of them.

The manner in which Providence has contrived a supply for the thirst of Man in sultry places is no less worthy of admiration. Nature has placed amidst the burning sands of Africa, a plant whose leaf, twisted round like a cruet, is always filled with a large glass-full of fresh-water; the gullet of this cruet is shut by the extremity of the leaf itself, so as to prevent the water from evaporating. She has planted on some parched districts of the same country a great tree, called by the Negroes *Boa*, the trunk of which, of a prodigious bulk, is naturally hollowed like a cistern. In the rainy season it receives it's fill of water, which continues fresh and cool in the greatest heats, by means of the tufted foliage which crowns it's summit. Finally, she has placed vegetable fountains on the parched rocks of the Antilles. There is commonly found on them a lianne, called the water lianne, so full of sap that if you cut a single branch of it, as much water is immediately discharged as a man can drink at a draught: it is perfectly pure and limpid.

In the swamps of the Bay of Campeachy travellers find relief of another kind. Those swamps, on a level with the Sea, are almost entirely inundated in the rainy season, and become so parched on the return of dry weather, that many huntsmen who happen to miss their way in the forests with which they are covered, actually perish with thirst. The celebrated traveller *Dampier* relates that he several times escaped this calamity, by means of a very extraordinary species

species of vegetation, which had been pointed out to him on the trunk of a kind of pine very common there; it resembles a packet of leaves piled one over another in tiers; and on account of it's form, and of the tree on which it grows, he calls it the pine-apple. This apple is full of water, so that on piercing it at the basis with a knife, there immediately flows from it a good pint of very clear and wholesome water. Father *du Tertre* informs us that he has several times found a similar refreshment in the leaves, rounded like a cornet, of a species of balizier, which grows on the sandy plains of Guadaloupe. I have been assured by many of our sportsmen, that nothing was more proper for the quenching of thirst than the leaves of the mistletoe, which grow on many trees.

Such are, in part, the precautions employed by Providence for compensating, in favour of Man, the inconveniencies of every climate; by opposing to the qualities of the elements contrary qualities in vegetables. I shall pursue them no farther, for I believe the subject to be inexhaustible. I am persuaded that every Latitude, and every season, has it's own, which are appropriated to it, and that every parallel varies them in every degree of Longitude.

Vegetable Harmonies of Plants with Man.

Were we now to examine the vegetable relations of plants to Man, we should find them to be infinite in number; they are the perpetual sources of our arts, of our manufactures, of our commerce, and of our enjoyments; but in our usual way, we shall just run over

over a few of their natural and direct relations, with which Man has intermingled nothing of his own.

To begin with their perfumes, Man appears to me the only being endowed with sensibility who is affected by these. Animals, it is granted, and especially bees and butterflies, have certain plants proper to themselves, which attract or repel them by their emanations; but these affections seem to be connected with their necessities. Man alone is sensible to the perfume and lustre of flowers, independently of all animal appetite. The dog himself, who from his domestic habits assumes so powerful a tincture of the manners and of the tastes of Man, appears totally insensible to that enjoyment. The impression which flowers make upon us seems connected with some moral affection; for there are some which enliven us, whereas others dispose us to melancholy, without our being able to assign any other reasons for it than those which I have endeavoured to unfold in examining some general Laws of Nature.

Instead of distinguishing them as yellow, red, blue, violet, we might divide them into gay, into serious, into melancholy: their character is so expressive, that lovers in the East employ their shades to describe the different degrees of their passion. Nature makes frequent use of it relatively to us with the same intention. When she wants to keep us at a distance from a marshy and unwholesome place, she scatters there poisonous plants, which present dingy colours and offensive smells. There is a species of arum which grows in the morasses of Magellan's Strait, whose flower exhibits the appearance of an ulcer, and exhales

hales an odour so strong of putrid flesh, that the flesh-fly resorts to it to deposit her eggs.

But the number of fetid plants is of no great extent. The Earth is clothed with flowers which for the most part have very pleasing hues and perfumes. I wish time would permit me to say something of the simple aggregation of flowers. This subject is so vast and so rich, that I hesitate not to affirm that it presents ample employment for the most famous Botanist in Europe, through his whole life, by discovering to him every day some new beauty, and that without removing above a league from his own habitation. All the art with which jewellers dispose their gems disappears before that which Nature displays in the assortment of flowers.

I shewed *J. J. Rousseau* the flowers of different trefoils which I had picked up, as I was walking with him: some of them were disposed in crowns, in half-crowns, in ears, in sheaves, with colours endlessly varied. While they were yet on their stems they had besides other aggregations, with the plants which were frequently opposed to them, in colours and in forms. I asked him whether Botanists gave themselves any trouble about those harmonies: he told me no; but that he had advised a young Painter of Lyons to learn Botany, with a particular view to study in it's forms and the assemblages of flowers; and that he had thus become one of the most celebrated pattern-drawers in Europe. On this subject I quoted to him a passage from *Pliny* with which he was highly delighted: it relates to a Painter of Sicyon, named *Pausias*, who learned by means of this study to paint flowers at least

as well as he of Lyons knew how to draw them: he had in truth a master as skilful as Nature herself, or rather one and the same with her, namely Love.

I shall give this story in the simplicity of style of the old Translator of *Pliny*, in order to preserve all it's vivacity.* "In his youth he became enamoured of "a nosegay girl of the same city with himself; her "name was *Glycera*; she was very pretty, and had "a singularly elegant taste in assorting a thousand "different ways the flowers of nosegays and chap-"lets; so that *Pausias*, copying after Nature the "chaplets and nosegays of his mistress, rendered "himself at length perfect in that art. Last of all, "he painted her seated in the attitude of composing "a chaplet of flowers; and this picture is considered "as his great master-piece: he called it *Stephano-"Plocos*, the garland-weaver, because *Glycera* had no "other means of relieving the pressure of poverty, "but making and selling garlands and nosegays. "And it is confidently affirmed that *L. Lucullus* gave "to *Dionysius* of Athens two talents, for a simple "copy of this picture."

This anecdote must have been singularly pleasing to *Pliny*, for he has repeated it in another place:† "Those of Peloponesus," says he, "were the first "who regulated the colours and the smells of the "flowers of which chaplets were composed. It was "however originally the invention of *Pausias*, a "Painter, and of a nosegay-girl named *Glycera* with "whom he was violently in love; whence he was

* *Pliny's* Natural History, book xxxv. chap. 2.

† Idem, book xxi. chap. 2.

"engaged

" engaged to imitate to the life the chaplets and " nosegays which she composed. But the girl varied " in so many ways the arrangement of the flowers " of her chaplets, in order to teize and employ her " lover, that it afforded very high amusement to " behold the skill of the Painter *Pausius*, and the " natural production of *Glycera*, striving for the " superiority."

Ancient Nature is still better acquainted with the subject than is the young *Glycera*. As it is impossible to follow her in her infinite variety, we shall make at least one observation respecting her regularity. It is this, that there is not any one odoriferous flower but what grows at the foot of Man, or at least within reach of his hand. All those of this description are placed on herbage, or on shubbery, as the heliotrope, the pink, the gilly-flower, the violet, the rose, the lilach. Nothing similar to these grows on the lofty trees of our forests; and if some flowers of brilliant appearance are displayed on certain tall trees of foreign countries, such as the tulip-tree, and the great chestnut of India, they have no very pleasant smell. Some trees of India, it is admitted, as the spice-bearing plants, are perfumed all over; but their flowers are not very showy, and do not partake of the odour of their leaves. The flowers of the cinnamon-tree smell like human excrement; this I know to be true by experience; if however the trees which were shewed to me in the Isle of France, in a plantation belonging to Mr. *Magon*, where the real cinnamon. The beautiful and fragrant flower of the magnolia grows on the lower part of the plant.

Besides the laurel which bears it is, as well as spice-trees, a plant of no great elevation.

It is possible I may be mistaken in some of my observations; but supposing them multiplied with respect to the same object, and attested by persons of veracity and exempted from the spirit of system, I am able to deduce general consequences from them which ought not to be a matter of indifference to the happiness of Mankind, by demonstrating to him the invariable intentions of benevolence in the AUTHOR of Nature. The varieties of their adaptation reflect mutual light; the means are different, but the end is constantly the same. The same goodness which has placed the fruit destined for the nourishment of Man within reach of his hand, must have likewise disposed his nosegay with similar attention to his conveniency. It may be here remarked that our fruit-trees are easily scaled, and different in this respect from most forest-trees. Farther, all those which produce fruits that are soft when in a state of perfect maturity, and which would have been liable to be bruised in falling, such as the fig, the mulberry, the plumb, the peach, the apricot, present their crop at a small distance from the ground: those, on the contrary, which yield hard fruit, and such as have nothing to risk from falling far, carry it aloft, as walnut-trees, chestnuts, and cocoas.

There is no less marvellousness of adaptation in the forms and sizes of fruits. Many of them are moulded for the mouth of Man, such as cherries and plumbs; others for his hand, such as pears and apples; others much larger, such as melons, have the sub-divisions marked,

marked, and seem destined to be a social family repast: nay there are some in India, as the jacque, and with ourselves the pumpion, large enough to be divided among a neighbourhood. Nature appears to have observed the same proportions in the various sizes of the fruits destined to the nutriment of Man, as in the magnitude of the leaves which are designed to afford him a shade in hot countries; for of these some are contrived to be a shelter for a single person, others for a whole family, and others for all the inhabitants of the same hamlet.

I shall not dwell long on the other relations which plants have with the habitation of Man, from their greatness and their attitude, though many very curious observations might be suggested on that subject. There are few of them but what are capable of embellishing his field, his roof, or his wall. I shall only remark that the vicinity of Man is beneficial to many plants. An anonymous missionary says it is firmly believed by the Indians, that the cocoa-trees which have houses around their roots become much more beautiful than those where there are none; as if that useful tree took delight in being near the habitation of Man.

Another missionary, a bare-footed Carmelite, called Father *Phillipe*, positively asserts that when the cocoa-tree is planted close by houses or huts, it is rendered more fruitful by the smoke, by the ashes, and by other circumstances connected with a human dwelling, so as to produce double the quantity of fruit. He adds that, for this reason, the places in India which consist of palm-plantations are crowded

with houses and little cabins; and that the proprietors of those plantations give, at first, a pecuniary premium as an inducement to come and live there, together with part of the crop when it is reaped. He farther adds, that though their fruits, which are very large and hard, frequently fall down from the trees when they have attained a state of full maturity, either by the gnawing of the rats, or by the violence of the winds, there is not a single instance known of any person's being hurt by the fall. This appears to me no less extraordinary than it did to him.*

I might extend the influences of Man to several of our fruit-trees, especially to the apple-tree and the vine. I never saw finer apple-trees in the Païs de Caux, than those which grow around the habitations of the peasantry. It is true that the attention of the proprietor may have greatly contributed to this. I have sometimes felt myself stopped in the streets of Paris, to contemplate with delight small vines, the roots of which are in the sand, and under the pavement, enriching with their clusters the complete front of a guard-house. One of them, I think about six or seven years ago, produced two crops in one year, as was announced in the public prints.

Animal Harmonies of Plants with Man.

But Nature was not satisfied with having given to Man a bower, and a carpet, loaded with fruit; this would not have thoroughly availed him, had she not likewise furnished him, in the vegetable order itself,

* See voyage to the East, of *R. P. Phillippe*, a white friar, Book vii. chap. 5, sect. 4.

with

with the means of defence against the depredations of wild beasts. In vain would he have watched over the preservation of his property through the day, had it been exposed to pillage during the night. She has bestowed a prickly shrubbery to inclose him round and round. The farther we advance southward we find the greater variety in the species of these. But on the contrary we see few, if any, of those thorny shrubs in the North, where they appear useless, there being no orchards to defend. They seem to be produced in both Indies for every kind of situation. Though I have been only on the selvage, as I may say, of those countries, I have seen there a great number of such shrubs, the study of which presented a great variety of curious remarks to a Naturalist.

Among others, I took particular notice of one in a garden of the Isle of France, which to me appeared proper for composing a fence impenetrable to the smallest of quadrupeds. It rises in form of a stake about the thickness of a man's arm, quite straight, without branches, and bearing no verdure except a small bunch of leaves on it's summit. It's bark is bristled all over with very strong and very sharp prickles. It attains the height of seven or eight feet, and grows as thick above as below. A series of these shrubs, planted close to each other, would form a real pallisado, without the smallest interval. The opuntia and the taper, so common under the Torrid Zone, are armed with prickles so keen that they pierce the soles of your shoes if you venture to walk over them. There is not a tiger, or lion, or elephant, that dares to approach them. There is another spe-

cies of thorn in the Island of Ceylon, which is employed as a defence against Man himself, accustomed as he is to force his way through every obstacle. *Robert Knox*, whom I have before quoted, informs us, that the avenues of the kingdom of Candy, in the Island of Ceylon, are blockaded only with faggots of those thorns, with which the inhabitants obstruct the passes of their mountains.

Man finds in vegetables protection not only against ferocious animals, but against reptiles and insects. Father *du Tertre* tells us that he one day found, in the Island of Guadaloupe, at the foot of a tree, a creeping plant, the stem of which presented the figure of a serpent. But he was much more surprized on perceiving seven or eight snakes lying dead around it. He communicated this discovery to a medical man, who by means of it performed many wonderful cures, by employing it in the cases of persons bitten by those dangerous reptiles. It is generally diffused over the rest of the Antilles Islands, in which it is known by the name of snake-wood. It is likewise found in the East-Indies. *John Hugo de Linschoten* ascribes to it the same figure and the same qualities.

We have in our own climates vegetables which present very strange correspondencies and contrasts with reptiles. *Pliny* tells us that serpents are very fond of the juniper and of the fennel, but that they are rarely found under the fern, the trefoil, the ash-weed, and the rue; and that betony kills them. Other plants, as has already been mentioned, destroy flies, such as certain species of the dionæa. *Thevenot* assures

assures us that in the Indies grooms defend their horses from the flies, by rubbing them every morning with the flowers of the pumpion. The fleabane, which bears black and shining grains resembling a flea, clears the house of that vermin, if *Dioscorides* is to be credited. The echium, which has it's seed formed like the head of a viper, is fatal to those reptiles. It is probable that from such configurations men, in the earlier ages of the World, discovered the relations and the oppositions between plants and animals. I am disposed to believe that each genus of insect has it's destructive vegetable with which we are unacquainted. In general, all vermin shuns perfume.

Nature has farther given us, in plants, the first patterns of nets for hunting and fishing. There grows on certain heaths in China a species of ratan so interwoven and so strong, as to catch and hold fast the stag, though in full vigour. I myself have seen on the sands of the sea-shore in the Isle of France a species of lianne, called the false-potatoe, which covers whole acres like a vast fishing-net. It is so perfectly adapted to this very purpose that the Negroes actually employ it in fishing. They form with the stems and foliage of it a very long series of cordages, which they cast into the sea; and having disposed them in a chain encompassing a great space on the water, they draw it ashore by the two extremities. They scarcely ever fail to bring out fish,* for the fishes are terrified not only by a net which encloses them, but by every unknown substance which forms

* See *Francis Pyrard's* Voyage to the Maldivias.

a shade on the surface of the water. By employing an industry equally simple, and nearly similar, the inhabitants of the Maldivia Islands carry on fisheries to a prodigious extent, employing no other means to decoy the fish into their receptacles, except a cord floating on the water with the help of sticks,

Human, or elementary, Harmonies of Plants.

There is not a single plant on the face of the Earth but what has certain relations to the necessities of Man, and which does not serve, somewhere or another, for clothing to him, for a shelter, for pleasure, for medicine, or at least for fuel. Some which with us are entirely useless are in high estimation in other parts of the World. The Egyptians put up frequent and fervent prayers for a plentiful crop of nettles, from the seeds of which they extract an oil, while the stem furnishes them with a thread which they weave into excellent cloth. But those general relations, being innumerable, I shall confine myself to a few particular observations respecting the plants which minister to the first of human wants, I mean the food of Man.

We remark, first, that corn, which serves for the general subsistence of the Human Race, is not produced by vegetables of a lofty stature, but by simple grasses. The principal support of human life is borne on herbage, and is exposed to the mercy of every breath of wind. There is reason to believe that had we ourselves been entrusted with the safety of our crops, we should not have failed to place them on great trees; but in this, as well as in every thing else,

else, we are bound to admire Divine Providence, and to mistrust our own wisdom. Had our harvests been the produce of the forests, in the event of these being destroyed by war, or set on fire through our own imprudence, or rooted up by the winds, or ravaged by inundations, whole ages would have been requisite to re-produce them in a country. Farther, the fruits of trees are much more liable to drop off than the seeds of grasses. The grasses, as has been already observed, carry their flowers in an ear, in many cases surmounted by little beards, which do not defend their seeds from the birds, as *Cicero* says, but which serve as so many little roofs to shelter them from the water which falls from Heaven. The drops of the rain cannot drown them, as they do flowers radiated, in disks, in roses, and in umbels, the forms of which however are adapted to certain places and to certain seasons; but those of the grasses are adapted to every exposure.

When they are borne in flowing and drooping plumes, such as those of most grasses of hot countries, they are sheltered from the heat of the Sun; and when collected into an ear, as those of most grasses of cold countries, they reflect his rays on at least one side. Farther, by the suppleness of their stems, strengthened by joints from distance to distance, and by their filiform and capillaceous leaves, they escape the violence of the winds. Their weakness avails them more than strength does the great trees. Like small fortunes, they are re-sown and multiplied by the very same tempests which lay waste the vast forests.

They

They farther resist the effect of excessive dryness by the length of their roots, which go in quest of moisture a great way under ground; and though their leaves are narrow, they have them in such numbers, that they cover the face of the ground with plants endlessly multiplied. At the slightest shower you see them all rear themselves into the air, at their extremities, as if they were so many claws. They even resist conflagration, which consumes so many trees in the forest. I have seen countries in which they every year set the herbage on fire in the season of the drought, recover themselves as soon as it rained with the most lovely verdure. Though this fire be so active as frequently to devour, root and branch, the trees which come into contact with it, the roots of herbage sustain no great injury.

They have moreover the faculty of re-producing themselves in three different ways, by shoots which push away from their roots, by creeping branches, which they extend to a distance, and by grains extremely volatile or indigestible, which the winds and the animals scatter about on every side. The greatest part of trees, on the contrary, naturally regenerate themselves only by their seeds. Add to the general advantages of grasses, an astonishing variety of characters in their florification and in their attitudes, which renders them more proper than vegetables of every other class, to grow in every variety of situation.

It is in this cosmopolite family, if I may be allowed the expression, that Nature has placed the principal aliment of Man; for the various species of corn, on which

which so many human tribes subsist, are only so many species of grasses. There is no land on the Globe where some kind of corn or another may not be raised. *Homer*, who had studied Nature so accurately, frequently characterizes each country by the vegetable peculiar to it. One island he celebrates for it's grapes, another for it's olive-trees, a third for its laurels, and a fourth for it's palms; but to the Earth only he gives the general epithet of Ζειδωρα, or corn-giving. Nature in fact has formed it for growing in all situations, from the Line to the very border of the Frozen Ocean. One species is adapted to the humid places of warm countries, as the rice of Asia, which grows in vast abundance in the muddy swamps by the side of the Ganges. Another is suited to the marshy grounds of cold countries; such is a kind of false-oats which naturally grows on the banks of the rivers of North-America, and of which many savage Nations annually raise immense crops.*

Other kinds of corn thrive wonderfully well on warm and dry lands, as the millet and the pannic of Africa, and the maize of Brasil. In our climates wheat agrees best with a strong soil, rye with a sandy one, buck-wheat with rainy declivities, oats with humid plains, barley with stony ground. Barley succeeds in the very bosom of the North. I have seen as far up as the sixty-first degree of North-Latitude, amidst the rocks of Finland, crops of this grain as beautiful as ever the plains of Palestine produced.

Corn affords an abundant supply to all the neces-

* Consult Father *Hennepin*, a Franciscan; *Champlain*, and other Travellers through North-America.

sities

sities of Man. With it's straw he enjoys the means of lodging, of covering, of warming himself, and of feeding his sheep, his cow, and his horse; with it's grain he can compound aliments and liquors of every flavour. The northern Nations brew it into beer, and distil from it strong waters more potent than those from wine; such are the distillations of Dantzick. The Chinese* extract from rice a wine as agreeable as the best wines of Spain. The Brasilians prepare their *ouicou* with maize. In a word, with oats torrefied it is possible to compose a cream which shall have the perfume of the vanilla. If we unite with these qualities those of the other domestic plants, most of which likewise grow all over the Earth, we shall find in them the savour of the clove, of pepper, of other spiceries; and without going farther than our own gardens, we shall be able to collect the delicacies scattered over the rest of the vegetable Creation.

We may distinguish in the barley and the oats, the elementary characters which have been formerly indicated, and which vary the species of plants of the same genus in a conformity to the situations where they are designed to grow. The barley destined to dry places has leaves broad and open at their base, which convey the rain-water to the root of the plant. The long beards which surmount the coat that is wrapped round the grain, are bristled with denticulations, very much adapted to the purpose of making them adhere to the hair of animals, and of resowing them in lofty and dry situations. The oats,

* Journey to China, by *Isbrand Ides*.

on

on the contrary, destined to humid places, have narrow leaves, gathered close around the stem, in order to intercept the rain-water. The coats of this plant distended, similar to two long half-bladders, and not very closely adhering to the grain, render it proper for floating, and for crossing the water by the help of the winds. But here we are presented with a still more wonderful fact, which will confirm what has been advanced respecting the uses of the different parts of plants relatively to the elements, and which extends the views of Nature even beyond the fructification, though we have considered this as the determining character; it is that barley, in rainy years, degenerates into oats, and that oats, in dry seasons, change into barley.

This observation, related by *Pliny*, *Galen*, and *Mathiola*, the Commentator of *Dioscorides*,* has been confirmed by the experiments of several modern Naturalists. *Mathiola* indeed alledges that this transformation of barley is not into oats properly so called, which he denominates *Bromos*, but into a plant which at first sight resembles it, and to which he gives the name of *Ægilops*. This transformation, demonstrated by the frequently repeated experiments of the husbandmen of his country, and by that which the father of *Galen* made expressly for his own satisfaction; together with that of the flowers of the linarium, and of the leaves of many vegetables, are sufficient proof that the elementary relations of plants are only secondary, and that animal or human relations are the primary. Thus Nature has placed the

* See *Mathiola* on *Dioscorides*, book iv. page 432.

character

character of a plant not only in the form of the fruit, but in the substance of that very fruit.

Hence I presume, that having formed in general of a mealy substance the basis of human life, Nature has diffused it over all situations, on different species of grasses; that afterwards, intending to add to this certain modifications relative to some humours of the human temperament, or to some influence of season or of climate, she has formed other combinations of it, which she has deposited in leguminous plants, such as pease and beans, which the Romans comprehended in the class of corn-plants; that finally she has formed another sort of it, which she has laid up in the fruits of trees, such as chestnuts, or in roots, as potatoes, and other farinaceous under-ground vegetables.

Those adaptations of substance to every climate are so infallibly certain, that in every country the fruit most common there is the best and most wholesome. Hence I farther presume that she has followed the same plan with respect to medicinal plants; and that having diffused over various families of vegetables, virtues relative to our blood, to our nerves, to our humors, she has modified them in every Country conformably to the diseases which the climate of each particular country generates, and has placed them in opposition with the particular characters of those same diseases. It is in my opinion from the neglect of these observations, that so many doubts and disputes have been excited respecting the virtues of plants. A simple, which in one country is an infallible cure for a malady, may sometimes increase it in another. The Jesuits-powder, which is the pounded bark

bark of a species of fresh-water manglier of Mexico, is a remedy for the fevers of America, of a kind peculiar to damp and hot situations, but frequently fails when applied to those of Europe. Every medicine is modified according to the place, just as every malady is.

I shall pursue this reflection no farther, as it would lead me into a deviation from my subject; but if Physicians would pay the attention to it which it merits, they must study more carefully the plants of their own country, and not prefer to them as they generally do, those of foreign climates, which they are under the necessity of modifying a thousand different ways, in order to give them, as chance may direct, an adaptation to local maladies. One thing is certain, namely, that when Nature has determined a certain savour in any vegetable, she repeats it all over the Earth with a variety of modifications, which do not however prevent our distinguishing it's principal virtue. Thus having placed the *cochlearia* (scurvy-grass), that powerful anti-scorbutic, even on the foggy shores of Spitzbergen, she has repeated the savour and the medicinal qualities of it, in the cresses of our brooks, in the garden cresses, in the nasturtium, which is a cress of the rivers of Peru; in a word, in the very grains of the papaya, which grows in humid places of the Antilles Islands. We find in like manner the savour, the smell, and the medicinal qualities of our garlic, in the woods, the barks, and the mosses of America.*

* I must here observe that garlic, the smell of which is so formidable to our fine ladies, is perhaps the most infallible remedy in the

These considerations induce me to believe that the elementary characters of plants, and their entire configuration, are only secondary means, and that their principal

the World against the vapours, and all the nervous disorders to which women are subject. Of this I have had repeated experience. Nay *Pliny* goes so far as to assure us that it is a cure for the epilepsy. It is besides an antiseptic; and every plant which has it's smell has also the same virtues. It is very remarkable that plants which smell like garlic, usually grow in marshy places, as a remedy provided by Nature against the putrid emanations thence exhaled. Such is, among others, the *scordium*. *Galen* relates, that it's antiseptic virtue became demonstrable from this, that after a battle, the dead bodies which happened to be in contact with plants of the scordium, were found to be in a much less putrid state than those which were not; and that those bodies remained fresh and sound chiefly in the parts which actually touched the plant. But the experiment which the Baron *Busbequius* made with it upon living bodies, is still more striking. That great Man, on his return from the first journey which he made to Constantinople, was attended by a numerous retinue. A Turk of his suite was attacked with the plague, and died. His companions resolutely divided his spoils among themselves, in defiance of the remonstrances of the Physician of *Busbequius*, who assured them that the pestilence would thereby be immediately communicated. In fact, a few days after, the symptoms of that dreadful malady became apparent among them.

But let us permit the intelligent and virtuous Ambassador himself to give an account of the consequences of this alarming event. "The day after our departure for Adrianople," says he, "they "all came to him (the Physician) with a sad and dejected air, "complaining of a violent head-ach, and imploring relief. They "were perfectly sensible that they were affected with the first symp- "toms of the pestilence. My Physician reprimanded them severe- "ly, saying he was astonished how they dared to apply to him for "a remedy for an evil of which he had forewarned them, and "which they had obstinately persisted in bringing upon themselves. "Not however that he intended to withhold any assistance which

"might

principal character is referable to the necessities of Man. Thus, in order to establish in plants an order simple and agreeable, instead of running over successively their elementary, vegetable, animal, and human harmonies, it would be more proper to invert this order, but without changing it, and to set out with the plants which present to Man a supply for his first wants, to proceed thence to the use which animals

" might be in his power. On the contrary, he became extremely " uneasy about the means of relieving them: But where was the " possibility of finding medicine on a road frequently subjected " to a failure of the most common necessaries of life? Providence " became our only refuge, and we were effectually succoured in " this trying hour. I shall relate in what manner.

" It was my custom on our arrival at the different halting- " places on the road, to go a walking in the vicinity, and to take " a view of every thing curious. That day I was so fortunate as " to bend my course to an adjacent meadow. My eye happened " to catch sight of a plant with which I was unacquainted: I " picked up some of it's leaves, and put them to my nose: they " smelled of garlic. I handed them to my Physician, asking him " if he knew the plant. After having attentively examined it, " he replied that it was the scordium. He lifted up his hands " to Heaven, and gave thanks to God for the seasonable relief " which He had sent us. He instantly gathered a considerable " quantity, put it into a large kettle, and boiled it thoroughly. " Then, calling for the patients, desired them to take courage, " and without the loss of a moment made them drink copiously " of the decoction of that plant, with a slight infusion of the " earth of Lemnos: he then had them well warmed and put to " bed, desiring them not to go to sleep till they had fallen into " a profuse perspiration, with which they exactly complied. The " next day they felt themselves greatly relieved. A similar dose " was repeated, and the whole ended in a perfect cure. Thus, " through the goodness of God we escaped a death which stared " us immediately in the face." (Letters of the Baron *Busbequius*, vol. i. pages 197 and 198.

derive from them, and to conclude with the situations which determine their varieties.

This order may be followed so much the more easily, that the first point of departure is fixed by the smell and the taste. The testimony of these two senses is far from being contemptible; for they assist us in ascertaining the intimate qualities of plants, much better than the decompositions of Chemistry; it may be extended to the whole vegetable kingdom, inasmuch as there is not a single genus of plants, varied into umbelliferous, rose-formed, papilionaceous, and the rest, but what presents food to Man in some part or another of the Globe. The ciperus of Ethiopia bears at it's root bulbs which have the taste of almonds. That which in Italy is called *Trasi* produces bulbs which taste like chestnuts.* We have found in America the potatoe in the class of *solana*, which are poisons. It is a jasmine of Arabia which supplies us with the coffee-berry. The eglantine with us produces berries fit only for the use of birds; but that of the land of Yesso, which grows there among rocks and the shells on the sea-shore, bears cups so large and so nourishing, that they serve for food to the inhabitants of those shores for a considerable part of the year.† The ferns of our hills are unproductive; but there grows in North-America a species of this plant, called *Felix baccifera*, loaded with berries which are very good to eat.‡ The tree itself of the Molucca Islands, called *Libbi* by the inhabitants and palm-sagoe

* See the Catalogue of Garden-Plants of Boulogne, by *Hyacinth Ambrosino.*

† Consult Collection of Voyages by *Thevenot.*

‡ See Father *Charlevoix*, his History of New France.

by

by travellers, is in the judgment of our Botanists merely a fern. This fern contains in it's trunk the sagoe, a substance lighter and more delicate than rice. In a word, there are even certain species of sea-weed which the Chinese eat with delight, among others those which compose the nests of a species of swallow.

By disposing in this order therefore the plants which produce the principal subsistence of Man, as the grasses, we should have, first for our own country, the wheat of strong lands, the rye of the sands, the barley of the rocks, the oats of humid places, the buck-wheat of rainy declivities; and for other climates and exposures, the pannic, the millet, the maize, the Canadian oats, the rice of Asia, some species of which thrive in dry situations; and so of the rest.

It would be farther useful to ascertain on the Globe the places to which the several origin of each alimentary plant might be referred. What I have to advance on this subject may be conjecture merely, but it appears to me to have an air of probability. I am of opinion then, that Nature has placed in islands the species of plants which are most beautiful, and best adapted to the necessities of Man. First, islands are more favourable to the elementary expansions of plants than the interior of continents, for there is no one but what enjoys the influences of all the elements, being completely surrounded by the winds and the seas, and frequently in it's interior possessing the combined advantages of plains, of sands, of lakes, of rocks, and of mountains. An island is a little world in epitome. Secondly, their particular temperature is so varied, that you find some of them in all the principal points of Longitude and Latitude,

though there be a considerable number still unknown to us, particularly in the South Seas. Finally, experience demonstrates that there is not a single fruit-tree in Europe but what becomes more beautiful in some of the islands along the coast, than in the Continent.

I have spoken of the beauty of the chestnut-trees of Corsica and Sicily: But *Pliny*, who has preserved to us the origin of the fruit-trees which were in Italy in his time, informs us that most of them had been imported from the islands of the Archipelago. The walnut came from Sardinia; the vine, the fig-tree, the olive and many other fruit-trees, were natives of the other islands of the Mediterranean. Nay he observes that the olive-tree, as well as several other plants, thrive only in the vicinity of the Sea. All modern travellers confirm these observations. *Tavernier*, who had so many times traversed the Asiatic Continent, assures us that no olive-trees are to be seen beyond Aleppo. An anonymous English traveller, whom I have already quoted with approbation, positively asserts that no where on the Continent are there to be found fig-trees, once to be compared, either as to magnitude or fertility, with those of the Archipelago, notwithstanding the carelessness and indolence of the wretched possessors. To these I might add a great many other vegetables, which thrive only in those islands, and which furnish to the commerce of Europe, gums, mannas, and dye-stuffs. The apple-tree, so common in France, produces no where such fine fruit, and of species so varied, as on the shores of Normandy, under the breath of the sea-breeze from the West. I have no doubt that the fruit which

was

was proposed as the prize of beauty had, like *Venus* herself, some favourite isle.

If we carry our remarks even into the Torrid Zone, we shall find that it is neither from Asia nor from Africa that we obtain the clove, the nutmeg, the cinnamon, the pepper of the best quality, the benzoin, the sandal-wood, the sagoe, and many others, but from the Molucca Islands, or from those which are in the same seas. The cocoa-tree attains it's perfect beauty only in the Maldivia Islands. Nay there are in the archipelagos of those Seas a great number of fruit trees described by *Dampier* which have not yet been transplanted into the Old Continent; such as the grape-tree. The double cocoa is to be found only in the Sechelles Islands. The islands recently discovered in the South-Sea, such as that of Otaheité, have presented us with trees hitherto unknown, as the bread-fruit and the mulberry-tree, the bark of which serves to make cloth. As much may be said of the vegetable productions of the Islands of America relatively to their Continent.

These observations might be extended even to the very birds and quadrupeds, which are more beautiful, and of species more varied in islands than any where else. The elephants held in highest estimation in Asia are those of the island of Ceylon. The Indians believe them to be possessed of something divine; nay more, they allege that other elephants acknowledge this superiority. One thing is certain, they fetch a higher price all over Asia than any others. In a word, travellers the most worthy of credit, and who have made the most accurate observations, as the English *Dampier*, Father *du Tertre*, and some

others, assure us, that there is not a shallow in the seas lying between the Tropics but what is distinguished by some sort of bird, of crab, of turtle, or of fish, which is no where else to be found, either of species so varied, or in so great abundance. I presume that Nature has thus scattered her choicest benefits over the islands, in order to allure men thither, and to pervade the Earth. These are only conjectures I grant, but they rarely deceive us when they are founded on the wisdom and goodness of the AUTHOR of Nature.

The finest species of corn, therefore, which is wheat, might be referred to Sicily, where in fact they pretend it was originally found. Fable has immortalized this discovery, by making that island the scene of the amours of *Ceres;* as well as the birth of *Bacchus*, in the Isle of Naxos, because of the beauty of it's vines. This much is certain, that corn is no where indigenous but in Sicily, if however it still reperpetuates itself there spontaneously, as the Ancients affirm.

After having determined in the same manner the other human accommodations of the grasses to different situations of ground, we might examine the grasses which exhibit marked relations to our domestic animals, such as the ox, the horse, the sheep, the dog. We might characterize them by the name of these animals. We should have the *gramen bovinum, equinum, ovinum, caninum.* The different species of each of these genera might afterwards be distinguished by the names of the different places where they are found by the several animals; on the banks of rivers, among rocks, on sands, on mountains; so that

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by the addition of the epithets, *fluviatile*, *saxatile*, *arenosum*, *montanum*, you might supply in two words, all the verbose phraseology of our botanical compositions.

We might apportion, in like manner, the other grasses to the different quadrupeds of our forests, as to the stag, to the hare, to the wild boar, and so on. These first determinations would require certain experiments to be made on the tastes of animals, but they would be very instructive, and highly amusing. They would have no mixture of cruelty, as most of those of our modern physics have, by which the wretched animal is flayed alive, poisoned, or suffocated, in order to come at the knowledge of it's propensities. Our experiments would study their appetites only, and not their convulsions. Besides, there are a great many of those preferred and rejected plants already well known to our shepherds. One of them shewed me, in the vicinity of Paris, a gramineous plant which fattens sheep more in a fortnight than the other species can do in two months. The moment too that the animals perceive it, they run after it with the utmost avidity. Of this I have been an eye-witness. I do not mean however to assert that each species of animal limits it's appetite to a single species of food. It is quite sufficient, in order to establish the order which I am proposing, that each of them gives, in every genus of plant a decided preference to some one species; and this is confirmed beyond all doubt by experience.

The great class of the gramineous plants being thus apportioned to Man and animals, other plants would present still greater facility in their appropria-

tions, because they are much less numerous. Of the fifteen hundred and fifty species of plants, enumerated by *Sebastian le Vaillant* in the country adjacent to Paris, there are more than a hundred families, among which that of the grasses comprehends, for it's share, eighty-five species, exclusive of twenty-six varieties, and our different sorts of corns. It is the most numerous next to that of mushrooms, which contains a hundred and ten species, and that of mosses, which contains eighty-six. Thus, instead of the systematic classification of botanic Writers, which gives no explanation of the uses of most of the vegetable parts, which frequently confounds plants the most heterogeneous, and separates those of the same genus, we should have an order simple, easy, agreeable, and of an infinite extent, which passing from Man to animals, to vegetables, and to the elements, would discover to us the plants which serve to our use and to that of other sensible beings, would render to each of them it's elementary relations, to each site on the Earth it's vegetable beauty, and would replenish the heart of Man with admiration and gratitude. This plan appears so much the more conformable to that of Nature, that it is entirely comprehended in the benediction which it's AUTHOR pronounced upon our first parents, saying unto them:* "Behold, I have given unto you every herb bearing "seed, which is upon the face of all the Earth, and "every tree, in the which is the fruit of a tree yielding seed, *after it's kind;* to you it shall be for meat: "and to every beast of the Earth, and to every fowl "of the air, and to every creeping thing that creepeth

* Genesis, chap. i. ver. 29, 30.

"upon

" upon the Earth, wherein there is life, I have given " every green herb for meat."

This benediction is not confined, as far as Man is concerned, to some primordial species in each genus. It is extended to the whole vegetable kingdom, which converts itself into aliment fit for his use by means of the domestic animals. *Linnæus* has presented to them from eight to nine hundred plants which Sweden produces, and he remarked that of these, the cow eats two hundred and eighty-six; the goat four hundred and fifty eight; the sheep four hundred and seventeen; the horse two hundred and seventy-eight; the hog one hundred and seven. The first animal refuses only one hundred and eighty-four of them; the second ninety-two; the third one hundred and twelve; the fourth two hundred and seven; the fifth one hundred and ninety. In these enumerations he comprehends only the plants which those animals eat with avidity, and those which they obstinately reject. The others are indifferent to them. They eat them when necessity requires, and even with pleasure, when they are tender. Not one of them goes to waste. Those which are rejected by some are a high delice to others. The most acrid, and even the most venomous, serve to fatten one or another. The goat browses on the ranunculus of the meadow, though hot as pepper, on the tithymal and the hemlock. The hog devours the horsetail and henbane. He did not put the ass to this kind of proof, for that animal does not live in Sweden, nor the rein-deer, which supplies the want of him to so much advantage in northern regions, nor the other domestic animals

mals, such as the duck, the goose, the hen, the pigeon, the cat, and the dog.

All these animals united, seemed destined to convert to our advantage every thing that vegetates, by means of their universal appetites, and especially by that inexplicable instinct of domesticity which attaches them to Man; whereas no art can communicate it either to that timid animal the deer, nor even to some of the smaller birds, which seek to live under our protection, such as the swallow, who builds her nest in our houses. Nature has bestowed this instinct of sociability with Man only on those whose services might be useful to him at all seasons; and she has given them a configuration wonderfully adapted to the different aspects of the vegetable kingdom.

I say nothing of the camel of the Arabian, which can travel under a load for several days together without drinking, in traversing the burning sands of Zara; nor of the rein-deer of the Laplander, whose deeply-cleft hoof can fasten, and run along on the surface of the snow; nor of the rhinoceros of the Siamese and of the Peguan, who with the folds of his skin, which he can distend at pleasure, is able to disengage himself out of the marshy grounds of Siriam; nor of the Asiatic elephant, whose foot divided into five ergots, is so sure on the steep mountains of the Torrid Zone; nor of the lama of Peru, who with his forked feet scrambles over the rocky heights of the Cordeliers. Every extraordinary situation is maintaining for Man a useful and commodious servant.

But without removing from our own hamlets, the single-hoofed horse pastures in the plains, the ponderous

rous cow in the bottom of the valley, the bounding sheep on the declivity of the hill, the scrambling goat on the sides of the rocks; the hog, furnished with a proboscis, rakes up the morass from the bottom; the goose and the duck feed on the fluviatic plants; the hen picks up every grain that was scattered about and in danger of being lost in the field; the four-winged bee collects a tribute from the small dust of the flowers; and the rapid pigeon hastens to save from loss the grains which the winds had conveyed to inaccessible rocks. All these animals, after having occupied through the day the various sites of vegetation return in the evening to the habitation of Man, with bleatings, with murmurings, with cries of joy, bringing back to him the delicious produce of the vegetable creation, transformed by a process altogether inconceivable into honey, into milk, into butter, into eggs, and into cream.

I take delight in representing to myself those early ages of the World when men travelled over the face of the Earth, attended by their flocks and herds, laying the whole vegetable kingdom under contribution. The Sun going before them in the Spring invited them to advance to the farthest extremities of the North, and to return with Autumn bringing up his train. His annual course in the Heavens seems to be regulated by the progress of Man over the Earth. While the Orb of day is advancing from the Tropic of Capricorn to that of Cancer, a traveller departing on foot from the Torrid Zone may arrive on the shores of the Frozen Ocean, and return thence into the Temperate Zone when the Sun traces backward his progress, at the rate of only four, or at most

five

five leagues a day, without being incommoded the whole journey through with either the sultry heat of Summer, or the frost of Winter. It is by regulating themselves according to the annual course of the Sun that certain Tartar-hordes still travel.

What a spectacle must the virgin Earth have presented to it's first inhabitants, while every thing was as yet in it's place, and Nature not yet degraded by the injudicious labours or the desperate madness of Man! I suppose them taking their departure from the banks of the Indus, that land which is the cradle of the Human Race, on a progress northward. They first crossed the lofty mountains of Bember, continually covered with snow, which like a rampart encompass the happy land of Cachemire, and separate it from the burning kingdom of Lahor.* They presented themselves to their eyes like vast amphitheatres of verdure, clothed to the South with all the vegetables of India, and to the North with all those of Europe. They descended into the vast bason which contains them, and there they beheld a part of the fruit-trees which were destined one day to enrich our orchards. The apricots of Media, and the peach-trees of Persia skirted, with their blossoming boughs the lakes, and the brooks of living water which bedew their roots. On leaving the ever-green valleys of Cachemire, they quickly penetrated into the forests of Europe, and went to repose under the foliage of the stately beech and tufted elm, which had as yet shaded only the loves of the feathered race, and which no Poet had hitherto sung. They crossed the boundless meadows which are washed by the Irtis,

* Consult *Bernier's* Description of the Mogul Country.

resembling

resembling Oceans of verdure, here and there diversified with long beds of yellow lilies, with stripes of ginzeng, and tufts of broad-leaved rhubarb. Following the track of it's current, they plunged into the forests of the North, under the majestic branches of the fir, and the moving foliage of the birch.

What smiling vallies opened to their view along the river's-side, and invited them to deviate from the road, by promising them objects still more lovely! What hills enamelled with unknown flowers, and crowned with ancient and venerable trees, endeavoured to persuade them to proceed no farther! Arrived on the shores of the Icy Sea a new order of things arose to view. There was now no more night. The Sun encompassed the Horizon round and round; and the mists, dispersed through the air, repeated on different planes the lustre of his rays in rainbows of purple, and parhelions of dazzling radiance. But if the magnificence of the Heavens was multiplied, desolation covered the face of the Earth. The Ocean was hoary with mountains of floating ice, which appeared in the Horizon like towers and cities in ruin; and on the land nothing was to be seen in place of groves, but a wretched shrubbery blasted by the winds, and instead of verdant meads rocks clothed with moss. The flocks which had accompanied them must there undoubtedly have perished; but even there Nature had still made provision for the necessities of Man. Those shores were composed of massy beds of coal.* The seas swarmed with fishes, and the lakes with fowls. They must find among the animal tribes servants and assistants: the rein-deer appeared

* Professor *Gmelin*'s Journey to Siberia.

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in the middle of the mosses: she presented to those wandering families the services of the horse in her agility, the fleece of the sheep in her fur; and shewing them, like the cow, her four teats, and but one nursling, she seemed to tell them that she was destined like her to share her milk with mothers oppressed by a too numerous offspring.

But the East must have been the part of the Globe which first attracted the attention of Mankind. That place of the Horizon where the Sun arises undoubtedly fixed their wondering eyes, at a period when no system had interposed to regulate opinion. On seeing that great Luminary arising from day to day, in the same quarter of the Heavens, they must have been persuaded that he there had a fixed habitation, and that he had another where he set, as a place of rest. Such imaginations, confirmed by the testimony of their eyes, were, it must be admitted, natural to men destitute of experience, who had attempted to erect a tower which should reach to Heaven, and who even in the illumination of more scientific ages believed, as a point of religion, that the Sun was drawn about in a chariot by horses, and retired every evening to repose in the arms of *Thetis*. I presume they would be determined to go in quest of him rather toward the East than toward the West, under the persuasion that they would greatly abridge their labour by advancing to meet him.

It must have been this conviction, I am disposed to think, which left the West, for a long time in a deserted state, under the very same Latitudes which in the East were swarming with inhabitants, and which first sent men in crowds toward the eastern part of our

our Continent, where the earliest and most populous Empire of the world, that of China, was formed. What confirms me farther in the belief that the first men who advanced toward the East were engaged in this research, and were in haste to reach their object, is this, that having taken their departure from India, the cradle of the Human Race, like the founders of other Nations, they did not like them people the Earth progressively, as Persia, Greece, Italy, and Gaul were successively, in a westerly direction; but leaving desert the vast and fertile countries of Siam, of Cochinchina, and of Tonquin, which are to this day half barbarous and uninhabited, they never gave up the pursuit till they were stopped by the Eastern Ocean; and they gave to the islands which they perceived at a distance, and on which they did not for a long time acquire the skill to land, the name of *Gepuen*, which we have transformed into Japan, and which in the Chinese language signifies birth of the Sun.

Father *Kircher** assures us, that when the first Jesuit Astronomers arrived in China, and there reformed the Calender, the Chinese believed the Sun and the Moon to be no bigger than they appear to the eye; that on setting they retired to a deep cave, from which they issued next day at the time of rising; and, finally, that the Earth was a plane and smooth surface. *Tacitus*, who has written History with such profound judgement, does not deem it to be beneath him, in that of Germany, to relate the traditions of the western Nations, who affirmed that toward the North-west was the place where the Sun went to bed,

* See China Illustrated, chap. ix.

and

and that they could hear the noise which he made on plunging into the waves.

It was from the quarter of the East, then, that the Orb of Day first attracted the curiosity of Mankind. There were likewise tribes which directed their course toward that point of the Globe, taking their departure from the southern part of India. These advanced along the peninsula of Malacca; and familiarized with the Sea, which they coasted most of the way, they were induced to form the resolution of availing themselves of the united accommodation which the two elements present to travellers, by navigating from island to island. They thus pervaded that vast belt of islands, which Nature has thrown into the Torrid Zone, like a bridge intersected by canals, in order to facilitate the communication of the two Worlds. When retarded by tempests or contrary winds, they drew their barks ashore, cast a few seeds into the ground, reaped the crop, and deferred their re-embarkation till fairer weather, and a season more favourable, encouraged them to venture to sea again.

Thus it was that the early mariners performed their voyages, and that the Phenicians, employed by *Necho*, King of Egypt, made the circuit of Africa in three years, departing by way of the Red Sea, and returning by the Mediterranean, according to the account given of it by *Herodotus*.*

The first Navigators, when they no longer saw islands in the Horizon, paid attention to the seeds which the Sea cast upon the shore of those where they were, and to the flight of the birds which were withdrawing from it. On the faith of these indications

* Herodotus, book iv.

they

they directed their course toward lands which they had never yet seen. Thus were discovered the immense Archipelago of the Moluccas, the Islands of Guam, of Quiros, of the Society, and undoubtedly many others which are still unknown to us. There was not one but what invited them to land, by presenting some attractive accommodation. Some stretched out along the waves like Nereïds, poured from their urns rills of fresh water into the Sea: it was thus that the island of Juan Fernandez, with it's rocks and cascades, presented itself to Admiral *Anson* in the midst of the South-Sea. Others, on the contrary, in the same Ocean, having their centres sunk, and their extremities elevated, and crowned with cocoa-trees, offered to their canoes basons at all seasons tranquil, swarming with fishes and sea fowls: such is that known by the name of *Woesterland*, or the Land of Water, discovered by the Dutch Navigator *Schouten*. Others, in the morning, appeared to them in the bosom of the azure main, all over irradiated with the light of the Sun, as that one of the same Archipelago which goes by the name of *Aurora*. Some announced themselves in the darkness of night by the flames of a volcano, as a pharos blazing aloft amidst the waters, or by the odoriferous emanations of their perfumes.

There was not one of them of which the woods, the hills, and the downs, did not maintain some animal, naturally familiar and gentle, but which becomes savage only from the cruel experience which it acquires of Man. They saw fluttering around them, as they disembarked on their strands, the silken-winged birds of paradise, the blue pigeons, the caca-

toës all over white, the lauris all red. Every new island tendered them some new present; crabs, fishes, shells, pearl-oysters, lobsters, turtles, ambergris; but the most agreeable, beyond all doubt, were the vegetables. Sumatra displayed on her shores, the pepper plant; Banda, the nutmeg; Amboyna, the clove: Ceram, the palm-sagoe; Florès, the benzoin and sandalwood; New-Guinea, groves of cocoa-trees; Otaheité, the bread-fruit. Every island arose in the midst of the Sea like a vase which supported a precious vegetable. When they discovered a tree laden with unknown fruit, they gathered some branches of it, and ran to meet their companions with shouts of joy, exhibiting this new benefit bestowed by Nature.

From those early voyages, and from those ancient customs it is, that there has been diffused over all Nations, the practice of consulting the flight of birds before engaging in any enterprize, and that of going to meet strangers with the branch of a tree in the hand, in token of peace, and of joy at sight of a present from Heaven. These customs still exist among the islanders of the South Sea, and among the free tribes of America. But not fruit-trees alone fixed the attention of the first Men. If some heroic action, or some irreparable disaster, had excited admiration, or inspired regret, the tree adjoining was ennobled by it. They preferred it with those fruits of virtue or of love, to such as produced food or perfume. Thus in the islands of Greece and of Italy, the laurel became the symbol of triumph, and the cypress that of eternal sorrow. The oak supplied crowns of undecaying honour to the well-deserving citizen, and

simple

simple grasses decorated the brows of the men who had saved their Country. O Romans! ye were a people worthy of the Empire of the World, in that you opened to every one of your subjects the career of virtuous exertion, and culled the most common plants of the field to serve as the badge of immortal glory, that a crown for the head of virtue might be found on every spot of the Globe.

From similar attractions it was, that from island to island the Nations of Asia made their way to the New World, where they landed on the shores of Peru. Thither they carried the name of children of that Sun whom they were pursuing. This brilliant chimera emboldened them to attempt the passage to America. It was not dissipated till they reached the shores of the Atlantic Ocean: but it diffused itself over the whole Continent, where most of the Chiefs of the Nations still assume the title of Children of the Sun.*

* I do not mean to affirm, however, that America was peopled only from the islands of the South-Sea. I believe that a passage was opened into it likewise by the North of Asia and of Europe. Nature always presents to Mankind different means for the attainment of the same end. But the principal population of the New World came from the islands of the South-Sea. This I am able to prove by a multitude of monuments still existing, and to the most remarkable of which I shall confine myself. It is demonstrated then by the worship of the Sun, established in India, in the islands of the South-Sea, and in Peru, as well as by the title of Suns, or Children of the Sun, assumed by many families of those countries; by the traditions of the Caraïbs scattered over the Antilles, and in Brasil, who give themselves out as originally from Peru; by the very establishment of the Monarchy of Peru, as well as that of Mexico, situated on the western coast of America, which looks toward the islands of the South-Sea, and by the populousness of their Nations, which were much more considerable and more

Mankind, encompassed with so many blessings, continues to be wretched. There is not a single genus of animal but what lives in abundance and liberty,

polished than those which inhabited the eastern coasts, which supposes the former to be of a much higher antiquity; by the prodigious diffusion of the Otaheitan language, the different dialects of which are spread over most of the islands of the South-Sea, and of which words innumerable are to be found in the language of Peru, as has lately been proved by a gentleman of great learning, and even in that of the Malays in Asia, some of which I myself was able to distinguish, particularly the word *maté*, which signifies to kill; by the practices common and peculiar to the Nations of the Peninsula of Malacca, of the islands of Asia, and those of the South-Sea and of Brasil; which are not the inspiration of Nature, such as that of making fermented and intoxicating liquors, and of chewing herbs and roots; by the channels of the commerce of antiquity which flowed in this direction, such as that of gold, which was very common in Arabia and in the Indies, in the time of the Romans, though there be very few mines of that metal in Asia; but above all, by the trade of emeralds, which must have run in that track from remote antiquity, in order to reach the Old Continent, where no mine of that gem is to be found. Hear what is said on this subject by *Tavernier*, who is worthy of credit when he speaks of the commerce of Asia, especially as it relates to jewels. "It is an error of long standing," says he, "which many persons have fallen into, to believe that "the emerald was found originally in the East. Most jewellers, "on first looking at a high-coloured emerald are accustomed to "say, this is an Oriental emerald. But they are mistaken, for I "am well assured, that the East never produced one, either on "the Continent, or in it's islands. I have made accurate enquiries "into this, in all the voyages I have made." He had travelled six times by land through India. Hence it must be concluded, that the so highly valued emeralds of the ancients, came to them from America, through the islands of the South-Sea, through those of Asia, through India, the Red-Sea, and, finally, through Egypt, from whence they had them.

To this may be objected the difficulty of navigating against the

regular

the greatest part without labour, all at peace with their species, all united to the objects of their choice, and enjoying the felicity of re-perpetuating themselves

regular easterly winds, in order to pass from Asia to America, under the Torrid Zone; but relatively to this subject, I shall repeat, that the regular winds do not blow there from the East, but from the North-east and South-east, and depend so much the more on the two Poles, the nearer you approach toward the Line. This oblique direction of the wind was sufficient for persons who navigated from island to island, and who had contrived barks the least liable to deflection, such as the double pros of the isles of Guam, the form of which seems to have been preserved in the double balses of the coast of Peru. *Schouten* found one of those double pros sailing more than six hundred leagues from the Island of Guam toward America. Besides, it appears likewise that the South-Sea has it's monsoons, which have not hitherto been observed. Hear the remarks made, on the variation of those winds, by an anonymous English Navigator, who sailed round the World, with Sir *Joseph Banks* and Mr. *Solander*, in the years 1768, 1769, 1770, and 1771, page 83. "The inhabitants of Otaheite trade with those "of the adjacent islands which lie to the eastward, and which we "had discovered on our passage. During three months of the "year, the winds which blow from the *West quarter* are very fa-"vourable to them for carrying on this traffic." Admiral *Anson* likewise met with winds from the West in those Latitudes, which retarded him.

Certain Philosophers explain the correspondencies to be found between the inhabitants of the islands and those of Continents, by supposing islands to be lands once united to the Continent, but now swallowed up by the Ocean, the summit only, and a few of the inhabitants upon it, remaining above the water. But enough has been already said in this Work, to evince that maritime islands are not fragments separated from the Continent, and that they have mountains, peaks, lakes, hills, proportionable to their extent, and directed to the regular winds which blow over their seas. They have vegetables peculiar to themselves, and which no where else attain the same degree of beauty. Farther, had those islands formerly constituted part of our Continent, we should find in them

all

by their families; whereas more than the half of Mankind is doomed to celibacy. The other half curses the bands which have matched him. The greater part tremble at the thought of rearing a progeny, under the apprehension of being incapable to find subsistence for them. The greater part, in order to procure subsistence for themselves, are subjected to painful labours, and are reduced to the condition of slaves to their fellow-creatures. Whole Nations are

all those of our quadrupeds which are to be met with in all climates; there were no rats nor mice in America, and in the Antilles, previous to the arrival of the Europeans, if we may believe the testimony of the Spanish Historian *Herrera*, and of Father *du Tertre*. We should likewise have found in them the ox, the ass, the camel, the horse, but they contained none of these animals; but plenty of our common poultry, ducks, dogs, swine, as well as among the Islanders of the South-Sea, who themselves had no other of our domestic animals. It is obvious that the first animals, such as the horse and the cow, being of a bulk and weight too considerable, could not possibly, be their utility ever so great, cross the seas in the small canoes of the early Navigators, who on the other hand would have been very careful not to transport with them such vermin as rats and mice.

Finally, let us revert to the general Laws of Nature. If all the islands of the South-Sea once formed a Continent, there must have been no sea then in the space which they occupy. Now it is indubitably certain, that were you at this day to take away from around them the Ocean by which they are encompassed, and the regular winds which blow over it, you would blast them with sterility. The islands of the South-Sea form, between Asia and America, a real bridge of communication, with a few arches alone of which we are acquainted, and of which it would not be difficult to discover the rest, from the other harmonies of the Globe. But here I restrain my conjectures on this subject. I have said enough to prove, that the same hand which has covered the Earth with plants and animals for the service of Man, has not neglected the different parts of his habitation.

exposed to perish by famine: others, destitute of territory, are piled a-top of each other, while the greatest part of the Globe is a wilderness.

There are many lands which never have been cultivated; but there is not one, known to Europeans, which has not been polluted with human blood. The very solitudes of the Ocean gulp down into their abysses vessels filled with men, sunk to the bottom by the hands of men. In cities, to all appearance so flourishing by their arts and their monuments, pride and craft, superstition and impiety, violence and perfidy, are in a state of incessant warfare, and keep the wretched inhabitants in perpetual alarm. The more that society is polished in them, the more numerous and cruel are the evils which oppress them. Is the industry of Man there most exerted, only because he is there most miserable? Why should the Empire of the Globe have been conferred on the single animal which had not the government of it's own passions? How comes it that Man, feeble and transitory, should be animated by passions at once ferocious and generous, despicable and immortal? How is it that, born without instinct, he should have been able to acquire such various knowledge? He has happily imitated all the arts of Nature, except that of being happy. All the traditions of the Human Race have preserved the origin of these strange contradictions; but Religion alone unfolds to us the cause of them. She informs us that Man is of a different order from the rest of animals; that his reason perverted has given offence to the AUTHOR of the Universe; that as a just punishment, he has been left to the direction of his

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own understanding; that he is capable of forming his reason only by the study of universal reason, displayed in the Works of Nature, and in the hopes which virtue inspires; that by such means alone he can be enabled to rise above the animal, beneath the level of which he is sunk, and to re-ascend, step by step, along the steepy declivity of the celestial mountain from which he has been precipitated.

Happy is he in these days, who instead of rambling over the World, can live remote from Mankind! Happy the man who knows nothing beyond the circumference of his own Horizon, and to whom even the next village is an unknown land! He has not placed his affections on objects which he must never more behold, nor left his reputation at the mercy of the wicked. He believes that innocence resides in hamlets, honour in palaces, and virtue in temples. His glory and his religion consist in communicating happiness to those around him. If he beholds not in his garden the fruits of Asia, or the shady groves of America, he cultivates the plants which delight his wife and children. He has no need of the monuments of Architecture to dignify and embellish his landscape. A tree, under the shade of which a virtuous man is reclined to rest, suggests to him sublime recollections; the poplar in the forest recals to his mind the combats of *Hercules*; and the foliage of the oak reminds him of the crowning garlands of the Capitol.

END OF THE SECOND VOLUME.

H. Bryer, Printer, Bridge-Street, Blackfriars, Lond

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